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CAR and DRIVER

FORMERLY SPORTS CARS ILLUSTRATED

May 1961
Vol. 6 No. 11

road research report

road tests

men and cars

features

how to

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This month's Car and Driver cover is made up of three color shots by our European Editor Jesse Alexander of Jaguar's exciting new 160 mph production sports car—the XKE.

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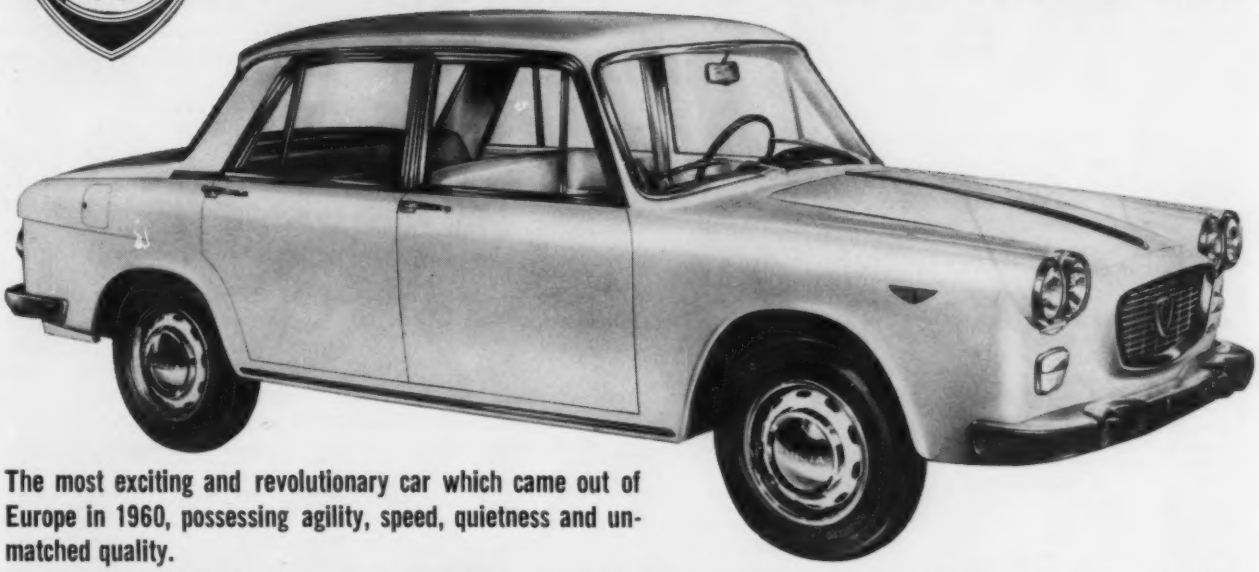

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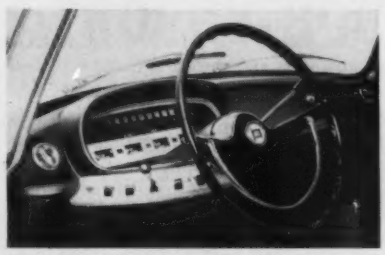
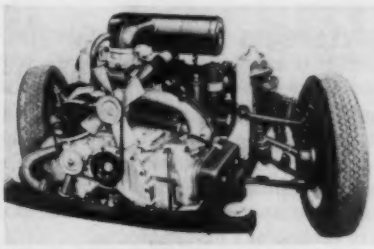


Leather-covered dash features big, easy-to-read gauges, and tachometer. Control switches are grouped in crescent-shaped unit under driver's left hand.



Key to performance and comfort of Lancia Flavia is the aluminum block 90 hp engine and the independent, double wishbone and torsion bar suspension.

Typical of the luxury are the seats... adjustable to sleeping position. Also, there are lights on the front-door edge that indicate when door is open or ajar.

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OBSERVATION AND OPINION

DRAMATIC G.P. YEAR – Don't I seem to remember a lot of fuss about the new 1½-liter Grand Prix Formula? Weren't a lot of people complaining that it would produce dull cars and duller racing? You never heard it in this column and you won't today. This issue of CAR AND DRIVER contains the latest scoop on the G.P. intentions of Maserati (page 18), Ferrari (page 46) and Porsche (page 60), and to us it looks like the most exciting Grand Prix year since the last Formula opened for business in 1954!

If you're not knocked out by Ferrari's superb new 120-degree V6, or by Climax plans to build a four-cam V8 that will later become a G.T. engine, then sit tight until the flat-eight Porsche makes its bow, likely embellished with desmodromy and fuel injection – or wait for the B.R.M. V8 – or for Maserati's own wild racing engine to take the place of its interim four that produces "only" 165 horsepower. We think the outlook is terrific. You can count on C/D for coverage in depth of this pivotal racing year.

BENT SIXES – Roger Huntington's evaluation of the V6 (page 84) keynotes another theme of this special Auto Show Issue. Ferrari's new wide-angle engine is an ideal layout of its kind, while he's followed through by using last year's G.P. V6 in this year's sports cars. That hairy new rear-engined Ferrari sports machine was rolled 1½ times by von Trips on its first outing, incidentally. "Crash" von Trips wasn't to blame, though; the right front brake disc disintegrated and set off the incident. Both car and driver emerged remarkably whole.

Briggs Weaver chose the V6 layout to power his wonderfully detailed conception of a 1961 Grand Prix car, for which you're invited to design the body. Don't miss the contest on page 81! Lancia, who got the V6 off the ground, is represented on the automotive scene by a car that we consider one of the most beautiful production automobiles in the world: the Touring-bodied Flaminia G.T.

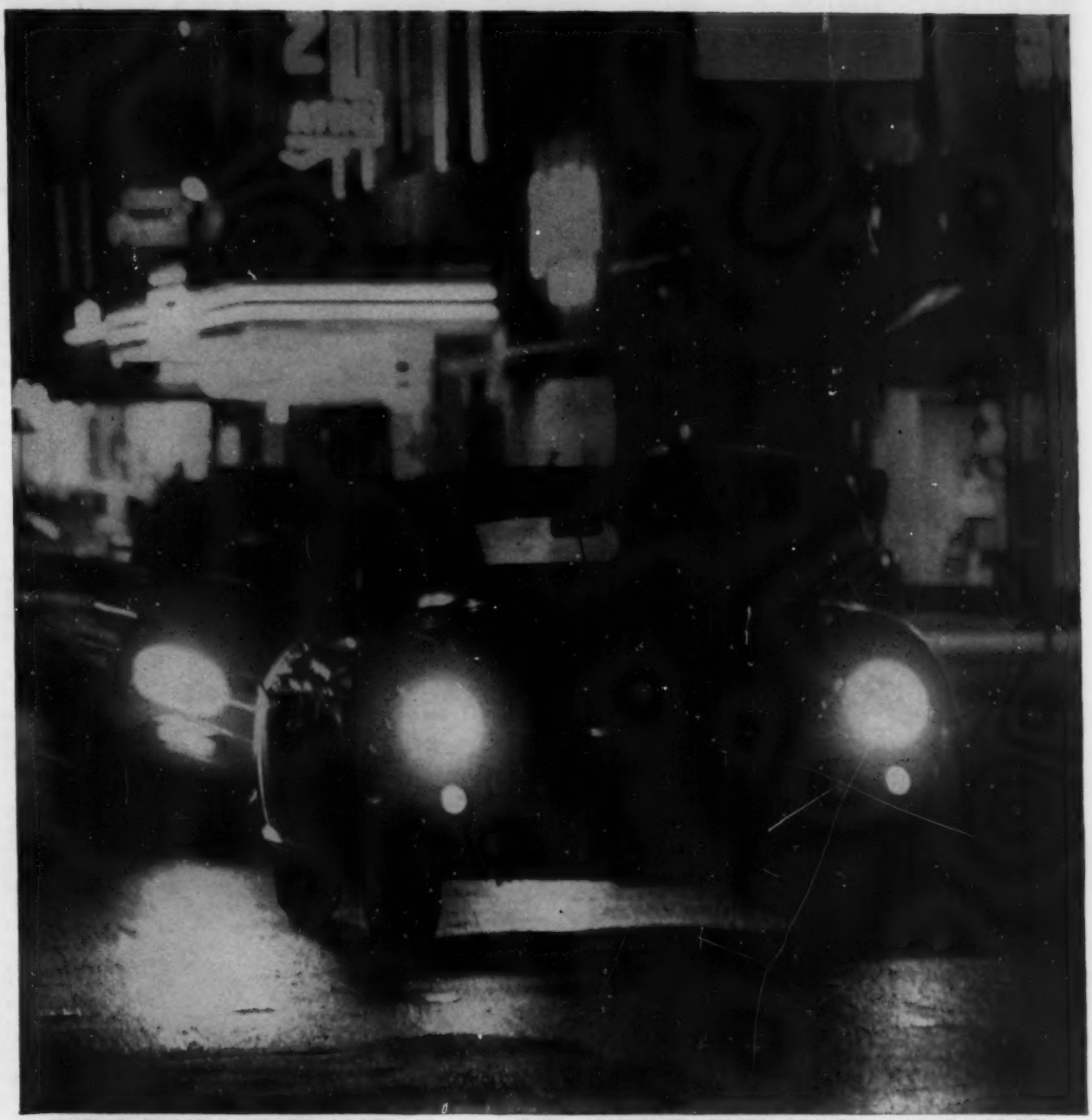
SHOW THAT SELLS CARS – There are many other auto shows in the U.S., to suit regional needs and to sell cars to dealers, but none presents such a wide range of cars to so many potential retail customers as New York's International Automobile Show. It's timed this year to give a shot in the arm to the car market at a time when it desperately needs it.

Importers have recognized its importance by choosing to introduce several major new models here. Among them is the positively sensational new Jaguar XKE, presented on our cover and in Jesse Alexander's seven-page report from Coventry. Peugeot's fine new 404 is Road-Researched this month, for its national unveiling, and Renault's lively new four-speed Gordini is Road-Tested for the same reason. You're getting your first look at a low new coupe version of the 220SE Mercedes, and at a handsome OSCA that should sell here.

DEVELOPING DEMAND – In C/D's view the miasma in which our domestic market is enveloped will dissipate as more motorists try the new compacts and find what a wonderful job they do at a minimum cost. Typical is the Oldsmobile F-85, which we drove cross-country for the road test that appears this month on page 82. It's a very able and enjoyable car with a great deal of character and more speed and roadholding than most diehard sports car fans will care to admit. To stimulate demand for these cars, their makers will soon announce special-equipment models that take an obvious cue from Chevy's very successful Corvair Monza.

DON'T PANIC! – We hope you'll agree this Auto Show Issue is worth six bits. We've packed it with the most exciting automotive news around the globe, with double the features and an increase in the number of editorial pages we normally carry. But we want to reassure our regular news-stand buyers that we don't intend to hike our price for any issue except this annual Auto Show extravaganza. See you next month, when we'll present a special section on British Cars and Drivers at *no* increase in price!

—Karl Ludvigsen



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LETTERS

IF I HAD $40,000 . . .

In your February issue there was a story on "The Last of the Red-Hot Alfas!" which I read through three times. If I had $40,000 I would buy one as fast as possible, but right now I just don't have 40,000 bucks. Since I'm not working, I have trouble buying cigarettes but now I have something to work for, one of the very best Alfas made and I thank you very much.

Craig S. Davis
(Address not given)

We suggest you kick the cigarette habit. Assuming you smoke a pack a day and instead save the money you would normally spend on cigarettes, it would take you no more than 146,000 days to save enough for the Alfa — and not only that, you would live to the ripe old age of 400 years.

YOU PAYS YOUR MONEY . . .

Re. your Triumph Herald-Climax test: Please! For one who must be different, or those who *must* buy British, fine . . . but you're talking in Alfa — Porsche quantities of green stuff!

For that matter, a Corvette in mild tune with four speeds lists at something near $3600 and will be sold at discount. Really. . . .

Phil Smith
Ann Arbor, Michigan

FERRARI: TOP CAR FOR '61?

I thoroughly enjoyed your September issue except for a comment by Jesse Alexander in the Dutch Grand Prix article. Mr. Alexander states "Ferrari is way out in left field despite the rear-engined car. They still seem to lack the plain know-how in getting a car right." What kind of doubletalk is this?

In the previous article on the Monaco race, he predicts the new Ferrari could develop into the most successful Ferrari ever! I admire Mr. Alexander for his seemingly vast knowledge of racing, however he certainly seems to hold a grudge against Ferrari. Their new machine is certainly a step in the right direction and could easily become *the* car this season as the 1½ liter engine displacement rule comes into effect. I do admit Mr. Ferrari's former front-engined "monsters" left much to be desired.

However, if Jesse thinks Enzo's organization lacks know-how, I suggest he recall the racing record of the Testa Rossa sports car. This machine, in my opinion, is the most fantastic racing car in the world — bar none! It's without a doubt the ultimate in beauty in motion or at rest. The utterly indescribable music of the engine has filled me with awe many times. Its latest overwhelming Le Mans victory is certainly well-deserved. Ferrari's G.T. coupes have proven to be almost unbeatable in touring classes. Their record speaks for themselves.

Thanks for letting me sound off. You have the best magazine in the field. Keep up the good work.

L. Wayne Williams
Ft. Lauderdale, Fla.

A MILLION FRENCHMEN CAN'T BE WRONG

I was delighted to see the story about the 2CV. A tribute to these immortal vehicles was long overdue.

Last summer my sister and I drove across France, Italy and Yugoslavia in one and became very fond of it. We only had trouble once, and that could hardly be blamed on the car. After the engine has been running oil drips down on the dipstick, making the oil reading deceptive. After long days of driving I would check the oil, only to find it right up to the top. Finally, in the middle of Yugoslavia, the oil-starved engine quit. Since the engine was brand new, we thought it would never be the same again.

Yet, after a day and a half in the shop, it was better than ever and on our way back we occasionaly caught and passed other 2CV's. The engine is the toughest unit made and we got used to being outdragged by Vespa 400s in town. We'd catch them on the long straights, though, as the speedometer climbed toward 80. (Never mention the km/hr part. Just "80" sounds more impressive.)

One question: why are the snazziest 2CVs from Belgium? Our little blue *voiture* looked very plain besides the sleek cars with "B" on the trunk lid. They were usually green or yellow and had flashy upholstery and extra windows on the rear quarter.

Paul C. Wilson
Exeter, New Hampshire

It does seem all the export-model 2CVs are better-equipped than the domestic edition. Our staff-owned car is a straight French machine, as supplied to this country, and lacks only one worthwhile refinement found on the British-built cars: an indicator light for low gas level instead of the long dipstick (motorboat style) provided with the car. The 2CV is truly an everlasting ball to drive.

TEMPEST GT TO BOW?

I have some first-hand news about the Pontiac Tempest. I was told by Mr. Knudsen (President of the Pontiac Division) that the Tempest will offer a two-door coupe sometime next month (March) as well as a four-speed box.

Bob Armacost
Shawnee Mission, Kansas

RACKMOBILE REACTIONS

In the February, 1961 SCI I was rather disheartened by a supposedly humorous article written by Jim Fisher, Jr. entitled "Rod Test: Rackmobile." I have always thought of your magazine as standing more or less neutral on rod vs. sports car debates, as both sports have much in common. Admittedly there are several things in the rod-custom field in which there's little sense, but in the future let's stick to our own business.

Gary C. Scales
Portageville, Missouri

(*Continued on page 8*)

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*Whichever comes first

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gordini — ***christened after the famous French race car designer — has proven its superiority in international competition:*** **Tour de Corse,** November 1959—1st, 2nd, & 3rd in Class (cars up to 1,000 cc) / **Rallye Neige et Glace-Grenoble,** January 1959—1st in Class (cars up to 1,000 cc), French cars only / **Ivory Coast Rallye-Abidjan,** February 1959—1st & 2nd (stock cars, any cc) / **Mille Miglia Brescia,** May 1959—1st, 2nd, & 3rd in Class (cars up to 1,000 cc) / **Senegal Rallye Dakar,** June 1960—1st & 2nd Overall / **French Mobile Economy Run,** July 1960—1st in Class, 49.21 m.p.g. (cars 700 to 1,000 cc) / **Tour de Corse,** November 1960—1st in Class (cars up to 1,150 cc).

(Continued from page 6)

. . . I would like to say that this article was not representative of real hot rods. Many if not all good rods are cars that have been built with precision and care, such as Mickey Thompson's Assault and Don Garlits's dragster.

John Dusten
Troy, New York

. . . You forgot that people who are interested in hot rods build their own cars instead of opening their pocketbooks and buying them as does the average sports car owner. No matter what the finished product may look like, they have at least invested their own time and talents in their cars.

Anthony J. Margerum
Elizabethville, Pennsylvania

Here's another good reason why our name is now CAR AND DRIVER. *The Rackmobile of Jim Fisher and Stan Mott was a lampoon of the gook wagons and shot rods that are an embarrassment to everybody interested in good road cars — not to mention its satiric attack on the kind of misguided commercialism (flame-injector spark plugs, mini-superchargers, etc.) that's so often wrongly attributed to hot rod developments. All too often you do see cars like the Standard and Deluxe Rackmobiles on the street, though, and not infrequently their counterparts in the sports car world. We have, indeed, remained neutral on the rod vs. sports car debates, to the point of feeling that there's no debate or controversy here — only misunderstanding.*

AMBITIOUS PROJECT

I am 16 years old and have subscribed to your magazine for five years. During this time I have become an expert "armchair Grand Prix driver." Not having a machine, I have built many models of cars. As a project for raising capital, I am starting production of models for sale to interested buyers. These models are standard kit models, precisely assembled, cemented and painted to the buyers' wishes.

The models I will construct are as follows: Porsche, Alfa, MG, Karmann-Ghia, Thunderbird, Indy racer, Corvette, Volkswagen, Rolls-Royce, Mercedes 300SL, Cunningham, Austin-Healey, Ferrari America and sports, and Maserati.

After careful calculation I figure that 4545 models will earn a new Wainer F. Jr. which would make me a very happy member of the sport.

Marc Pauls
733 Elkington
Olivette 32, Missouri

BUICK FAN

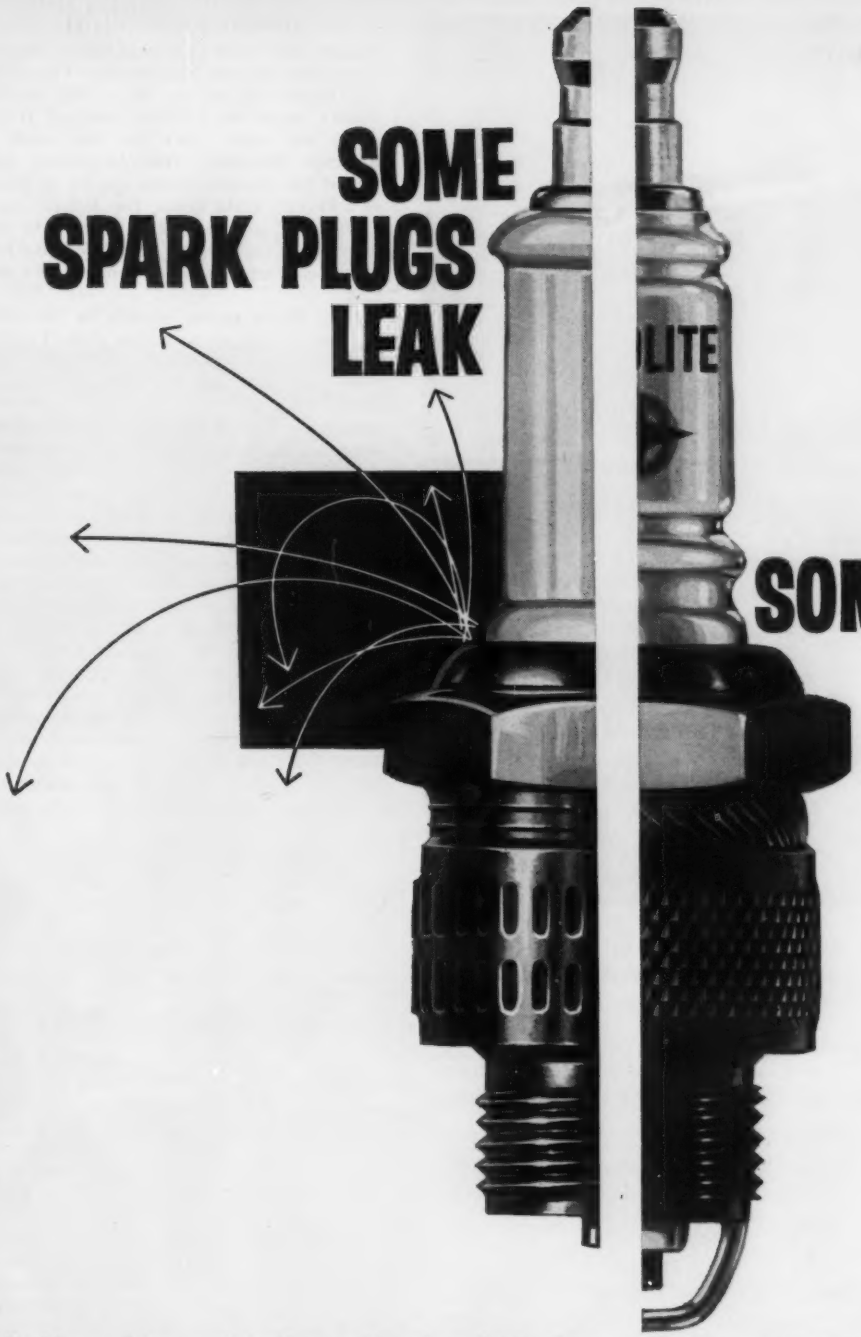
I've been reading back issues of SCI and have decided to get a load off my mind. With each issue, it gets heavier!

Granted that the Corvette engine is a very good production, the impression you give is that it's the most fabulous design ever to grace a drawing board. We do produce other engines, you know. For example Buick. Max Balchowsky — at a cost approximately ten percent that of the Scarab's — built a car that's as competitive as the Scarab. Above that, the big Buick uses a high percentage of production parts.

Another interesting note is that Chevy

(Continued on page 10)

SOME SPARK PLUGS LEAK



SOME DON'T!

Problem: Some automotive spark plugs leak. Even when new. They leak because the insulator is not perfectly sealed to the outer steel shell. And this leakage, as you might expect, does nothing to improve either your gas mileage or your pick-up and performance.

How can you avoid buying spark plugs that could leak? Simple. Just look at them before you buy. Appearance tells you a lot about how the plugs were sealed. Take the shiny plugs you may have seen on your dealer's shelves. Most of these shiny plugs are sealed with powered talc. They're not guaranteed against leakage. They are not acceptable for severe military service.

What other kind of spark plug is there? The blue kind. The kind Autolite makes. In these plugs, the shell is sealed to the insulator under tremendous heat and pressure. Autolite guarantees every plug against leakage. We also sell many thousands of them to the military.

Suggestion: There are two ways to make sure your next set of spark plugs does not leak. Take a good look at them before you buy, or, easier still, simply insist on Autolite. We make a set to fit almost anything with wheels. Remember, the color is blue, the name is Autolite.

AUTOLITE®
SPARK PLUG DIVISION • TOLEDO 1, OHIO

(*Continued from page 8*)

owners don't seem to remain Chevy owners. The owner of your highly-touted Chevrolet 315 traded in on an Alfa; Bill Krause doesn't drive his Corvette-powered D-Jag much any more (he's too busy with a Birdcage Maserati); Dick Morgenson discarded his Corvette-Devin special in favor of a Ferrari Testa Rossa; Jim Jeffords tools a Birdcage in place of a Scarab. As for production Corvettes, a stock Corvette has about as much chance of winning as a go-kart.

Your Chevy praise extends to Corvairs; you hardly ever say anything about Falcon, but who smeared whom at Bonneville? Also, your excellent class-winning streamliner wasn't powered by the flat six. Where was Chevy when Karol Miller pushed a '60 Ford Starliner at better than 157 mph?

Jack F. Diehl Jr.
Concord, California

Examine recent SCIs as well as the old ones. August, '60 gave both Buick and Balchowsky the credit they so richly deserve, and November, '60 commended Buick again for the design of a new engine that promises to be as popular as the Chevy is today. That's the obvious key: popularity, not sheer design perfection. We stated unequivocally in October, 1960, that in our opinion the Ferrari V12 "is the most fabulous design ever to grace a drawing board." But you're not likely to be buying one and building a racing car around it, as you can with the remarkable Chev.

PERFORMANCE IN A PRINZ

I have read your road test on the BMW 700 and NSU Sport Prinz and take vigorous exception to a sentence in the last paragraph, to wit: "Both have been designed for the would-be sports car owner. . . ."

Over the years, I have owned and driven several "sports cars" *per se* . . . the most recent being a Porsche 1500 which I traded last November for an NSU Sport Prinz. I have many trophies to prove I drive my sports cars actively and hard; up to last year, I thought the Porsche was "tops," but since trading it for the Sport Prinz, I have changed my mind. . . . This NSU Sport Prinz is "IT."

With 35 cubic inches I get over a measured mile (mild tune) 86.22 mph. I do the quarter-mile in no more than 22 seconds and have had a best time of 21.6 seconds. The speed at the end of the quarter (best time) is 64 mph. These figures are on record with the timing association here.

As for gas mileage, tankful to tankful, I have gotten as much as 53 mpg on a trip at a steady 60 and never get less than 43 mpg in city driving. The odometer reads 13,766 and I've changed spark plugs once. Did you know the NSU 35 cubic-inch engine has the lowest breakdown index of all production cars in the world? This NSU G.T. is, in my opinion, one of the finest examples of a true "sports car" of all I have ever owned or driven. And it's all done on a measly 35 cubic inches! Last Sunday, at the local dragway, my 17-year old son cleaned up on Simcas and Sprites too.

Jack Lozier
Corpus Christi, Texas

(*Continued on page 12*)

ACCELERATION
0-100 and stop in 26.2 seconds

TOP SPEED
140 miles per hour

...wings and propeller optional!

ASTON MARTIN

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(Continued from page 10)

LEST WE FORGET

Don't we hear enough in your magazine about Jaguars, Ferraris, Maseratis, Corvettes and Porsches? How about some new blood? Remember Aston Martin? They won the sports car constructors championship in 1959.

In the next few years DB4GTs will be giving Ferraris their hottest competition. It's a new design and for a first year model it's done extremely well. Salvadori proved they could go at Goodwood when he made the fastest lap despite Moss being in a Ferrari. A recent road test of the sedan showed a top speed of 140 mph with the 3.54 rear axle.

I'm sure you would agree it would be a shame if every GT race in Europe were turned into a Ferrari benefit. But if Lance Reventlow has the guts to go out on a limb with his Scarabs why can't somebody in Europe do the same. Astons may not *yet* have the performance of a Berlinetta, but *courage, mes enfants,* time heals everything.

G. B. Grant
Streatham, England

Mr. Grant will find a Driver's Report of the DB4GT in the next issue. Like him, we too are watching Aston Martin's race progress with interest.

AUSSIES DEFEND PORSCHE

May I be permitted to express another Australian viewpoint. The November 1960 SCI contained a letter from a Mr. Stinson stating that the Buckle "ball of fire" would "leave a Porsche for dead in performance, has a top speed of 132 mph and costs half the price of a Porsche. . ."

These are the facts: 1 At the time of this writing a standard Buckle coupe cost 1890 Pounds, a standard Porsche coupe, 2695 Pounds. The Buckle records the standing quarter-mile in 18 seconds at the sprints and so does a standard Porsche. The standard Buckle does 100 mph and so does a Porsche. 2 My Porsche Super cost 2750 Pounds and the Buckle with the Raymond Mays head at 2150 Pounds. This is certainly more than one-half the price. My stock standard Porsche has been timed at an *average* of 16.97 for the standing quarter, the Raymond Mays Buckle doesn't "leave this for dead." 3 The two hottest Buckles in the country (almost three-liters) have yet to beat an S90 around a track (Bathurst and Warwick, 1960). My viewpoint, after seeing an S90 beat both Lotus Elite S III and Buckles is that this "ball of fire" may perform in a straight line but doesn't compare with Porsche, Corvette, Elite, Twin-cam or any car with such handling.

Michael Symons
Sydney, Australia

Another letter from a Sydney Porsche enthusiast quoted much the same statistics as Mr. Symons's. He also maintained ownership of a Holden is "a good proposition," adding:

. . . facts will show that the Buckle cannot compare with a Corvette, a Porsche or any other good sports car, let alone "leave it for dead."

The standard of finish on this fiberglass-bodied Buckle is far below that of a Porsche and even if they were sold for half the price, I would not swap my Porsche for two of them.

Wallace N. Smith
Sydney, Australia

what's your pleasure?

Step up and place your order for a new Corvette, set u to be as smooth and mild, or as hairy-chested-potent a you like. This is a real machine, the only *true* sports car built in this country and one with an array of engin transmission and luxury options* unmatched by any sports car anywhere. It goes like an irresistible forc and stops like an immovable object. It's a car to brag about, and it's a car that can back its brag anywher any time; just check the record of the last four years of sports car activity. Sports cars have come and gon but Corvette has been capturing new accolades ever since that first V8 let out its newborn yell of defiance.

Corvette by Chevrole

Chevrolet Division of General Motors, Detroit 2, Michigan

*Optional at extra c

DETROIT NEWSLETTER

by Roger Huntington

Two recent new-model announcements illustrate interesting variations in the concept of the high-performance "personal car" for the American market.

First there is Oldsmobile's new Starfire convertible. It's pretty much a standard 88 convertible with a lot of extra-cost accessories as standard equipment (power steering, Hydra-Matic, electric window lifts, white sidewalls, etc.), luxury trim and interior, a slightly hopped-up engine and a 3.42 to one axle ratio. The driving compartment is split by a panel between instrument board and transmission hump, faced with a little 6000-rpm tach. A horizontal control board between the seats mounts a short shift lever for the Hydra-Matic, buttons for the window lifts and a small storage compartment. Beautiful bucket seats are featured front and rear. Engine horsepower rating is raised from 325 to 330 by a ¼-point boost in compression (to 10.25 to one) and hotter hydraulic-lifter cam. (The rating must be conservative, though, because 0-60 mph times of 8.5 seconds are reported with a curb weight of 4500 pounds.)

Anyway this is *one* concept of the ideal American "personal car"—something that will appeal to what some have come to call the "Thunderbird market."

CHEV SUPER SPORT

In contrast to this is Chevrolet's new "Super Sport" modification of the basic Impala series. These cars have gimmicks, too (color-keyed interiors, optional bucket seats, wheel covers with simulated knock-off hubs, padded assist bar on the passenger side, and such), but they also carry heavy-duty springs and shocks and sintered metallic brake linings as standard equipment—for safer and better handling on the road. The engine and transmission options have performance written all over them. (You may recall the story on the Chev. "police car" in the July, 1959 SCI.) If you insist on an automatic transmission you can order the heavy duty Powerglide behind a 305-bhp engine (348-cubic inch block) with the big-valve heads and standard hydraulic cam. This engine is also available with the well-known Borg-Warner 4-speed transmission. If you want more performance you can get the 340-bhp engine with 4-barrel carb and solid lifters, or the same engine with three 2-throat Rochesters rated at 350 bhp at 6000 rpm. Both engines are only available with the 4-speed. Later on the new 409-cubic inch 360-bhp Daytona engine will be offered. In addition you can order rear end gears up to 4.56 to one and the limited-slip Positraction differential. And all cars carry a 7000-rpm electric tachometer on the steering column.

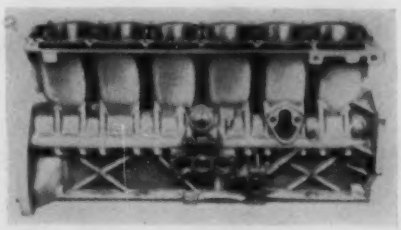
There is room for another concept of a "personal car" for the American market. This one's a real high-performance G.T. car—maybe not in the same sense as a G.T. Ferrari, which would be suitable for racing at Le Mans, but in the sense that it's specifically designed for maintaining a high *average* speed on a given road, with reasonable comfort and safety. Chevrolet is streets ahead of the rest of the industry in the design and marketing of this type of car. We expect to see a lot more of this sort of thing from Chev in the near future. It appears at this writing the future corporate choice for the move will be the enthusiast-enticing Corvair!

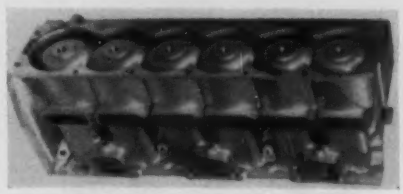
ALUMINUM: HERE TO STAY?

There has been a lot of discussion about the benefits of faster machining and decreased tool wear with aluminum auto parts, as compared with steel and cast iron parts. Some engineers say this is the feature that will really "sell" aluminum to the industry. Others say the machining benefits in terms of actual dollars-and-cents savings are over-rated.

I was interested to see some actual figures given on this matter in a recent SAE paper on the die-cast aluminum cylinder block used in some 6-cylinder Chrysler products. One particular machining operation called for drilling a ¼-inch hole 1.92 inches deep in the block. In a cast iron block it takes 22 seconds to drill the hole, and the drill must be resharpened after 800 passes. Drilling aluminum takes just half as long—11 seconds—and the drill lasts for 3000 passes! Unfortunately the paper didn't tell what this meant in cost savings on the part. Maybe it wasn't as much as it would seem. But it is also true that many tool engineers say we have barely scratched the surface in really *exploiting* the easy machining qualities of aluminum. Maybe someday they'll be able to drill that hole in three or four seconds, with a tool that lasts for months! It will be an interesting field to watch.

Meanwhile, it's been announced that the Plymouth Division is offering a new aluminum engine in its compact. Called the Super 225, it has (like the Lancer) a 225 cubic inch displacement developing 145 bhp with a compression ratio of 8.2 to one. The standard Valiant engine has 170 cubic inches and 101 bhp. The suggested factory retail price for the engine option is $43.75.





Enthusiasts often forget that while die-casting aluminum is the latest gambit of auto manufacturers here, outboard motor makers have been doing it for years. While this has nothing directly to do with cars, it might be interesting to take a look at Mercury (outboards) die-cast aluminum six. The combustion chamber you'll note is cast integrally with the block. In-line sixes have been produced by the thousands by Mercury in 60 and 70 bhp versions and now in 80 bhp form. Such die-cast blocks in two and four cylinder configuration have been offered since 1947. The two photos show the latest Dodge aluminum block, upper, and the Mercury outboard unit.

CERV 1 CAMMING

I was talking to Arkus-Duntov about the new "Chevrolet Engineering Research Vehicle" (CERV 1). It seems that the ultimate output of 353 bhp at 6200 rpm was *not* achieved with the standard "Duntov" cam as used in the '61 315-bhp f.i. Corvette. This was a slightly modified grind, and it gave its maximum torque of 325 lb.-ft. at 4800 rpm. But here's the kicker: the standard Duntov cam showed just under 350 bhp at 6200 rpm—and *335 lb.-ft.* of torque at 4800! The more I see of the Chevrolet performance picture, the more respect I have for this five-year-old Duntov cam that you can buy over the counter for $18 in any Chev parts house. It leaves much to be

(*Continued on page 16*)

This non-standard Valiant with what appears to be a convertible top was snapped recently in Chicago.

MOST DECEPTIVE CAR ON THE ROAD

This is Lancer, the new Dodge compact. Don't underestimate the next one you meet at a traffic light. Especially if that Lancer has a Charger 225 engine* under its hood. That's a 225 cubic inch inclined engine that thrives on revs. And to go with it, Lancer has a transmission (floor-mounted stick or pushbutton automatic) that knows just how to put those revs to best use. Lancer also has a well thought-out pairing of fully unitized body, torsion bars up front, and asymmetrical leaf springs in the rear to cut the most devastating road down to size. In one tidy package (available in six models) the new Dodge Lancer wraps up enough to make the dourest sports car buff draw a quick and envious breath. See your Dodge Dealer. Ask him for a turn at the wheel of Lancer—the most powerful low-price compact in America. He'll be delighted to take you out!

DODGE

LANCER

*Optional at a modest ($47.35) manufacturer's suggested price

LOOK WHAT DODGE HAS DONE FOR LOW PRICE COMPACTS

(Continued from page 14)

desired in mid-range torque (apparently a necessary consequence of the low acceleration rates used to get long lobe-lifter life); but it's really hard to beat it on the top end.

One clever new idea that helps power are the tapered ram tubes between the fuel injection plenum chamber and head ports. These taper down from a large diameter under the plenum to the diameter of the head ports. The idea is to accelerate the air gradually from virtually zero velocity in the plenum to over 200 ft./sec. at the port – to reduce the "shock losses" associated with very sudden acceleration of an air mass. The 16-inch length between plenum and intake valve would suggest a major resonant boost at around 6000 rpm for maximum power – while the 40-inch exhaust pipe length would tune near 5000 for torque. Duntov admits that this intake and exhaust refinement is the big reason behind the astonishing 1.25 bhp per cu.in., as the rest of the engine is basically '61 Corvette. Incidentally, the block and heads are cast of a hypereutectic silicon-aluminum alloy, which is hard enough to take the rubbing of the pistons and pounding of valves without ferrous inserts. I gathered that Duntov felt this was the answer for large-scale use of aluminum in American engines – *when* we learn to cast it in production!

Road performance? The only figure Duntov could quote was a distance of approximately 8/10ths of a mile required to accelerate from a 20-mph rolling start in low gear to 165 mph. That's undoubtedly furious acceleration, but it's hard to relate to parameters we're more familiar with. I would estimate the standing ¼-mile time (with proper gearing and soft, high-traction tires) at 11.0-11.5 seconds, with a terminal speed of 130 mph. Ultimate top speed with proper gearing would approach 200. You can have so much fun with money!

SMALL-CAR SALES

The word around Detroit is that the swift sales drop of most small imported sedans (except VW) last year is causing much head-scratching over plans for American entrants in this price class. At one time last fall the word was that Ford had definitely committed itself on a VW-size car for the '62 model year. (This was the Cardinal project we've heard so much about.) The design was said to have been finished (on a front-drive 4-cylinder layout), and tooling was well under way. Chevrolet was said to be close behind. Chrysler a little farther back (with an air-cooled V4 engine) – and even little Studebaker later admitted that it had a "junior compact" in the oven.

Now there is evidence that activity has slowed down a lot in the last few months. Apparently the deep drop of Renault and Fiat sales scared our industry. Executives wonder if this is just a sign of waning glamour of imported car ownership as such – or whether the public is losing interest in very small passenger cars in general. In other words, will the people buy a small car produced here, or won't they buy any at all?

You can bet that some men are doing some pretty serious thinking on this one these days.

—*RH*

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EUROPEAN NEWSLETTER

MCKAY

There's a lot of hairy-chested European machinery in the South Pacific and big crowds attend races.

FORMULA 1 MASER

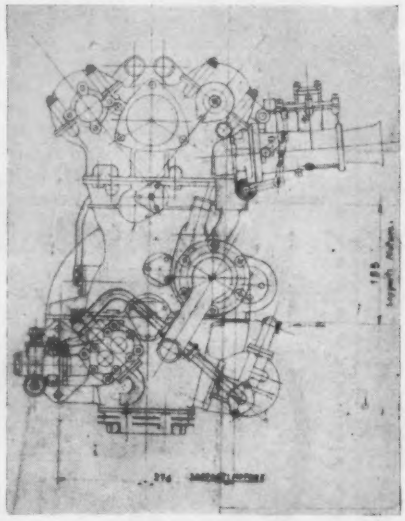
About the time you read this, the Maserati birdcage Formula 1 car will be ready for initial trials. The first tubes of the chassis were being welded up in early February. Power will probably be a 1.5-liter version of the four-cylinder sports car engine. With a solid background of experience with the spaghetti frame behind them, the Orsi-controlled factory should come up with an interesting rear-engined design. Naturally, independent rear suspension will be part of the specification as it is on the latest rear-engined sports car, the Type 63.

Maserati has carried out a lot of experiments with a sleeved-down 1½-liter version of the famous 2½-liter V12, working toward an engine for its own exclusive use. This is likely to materialize late in 1961, possibly as a six or an eight derived from the exciting but little used V12.

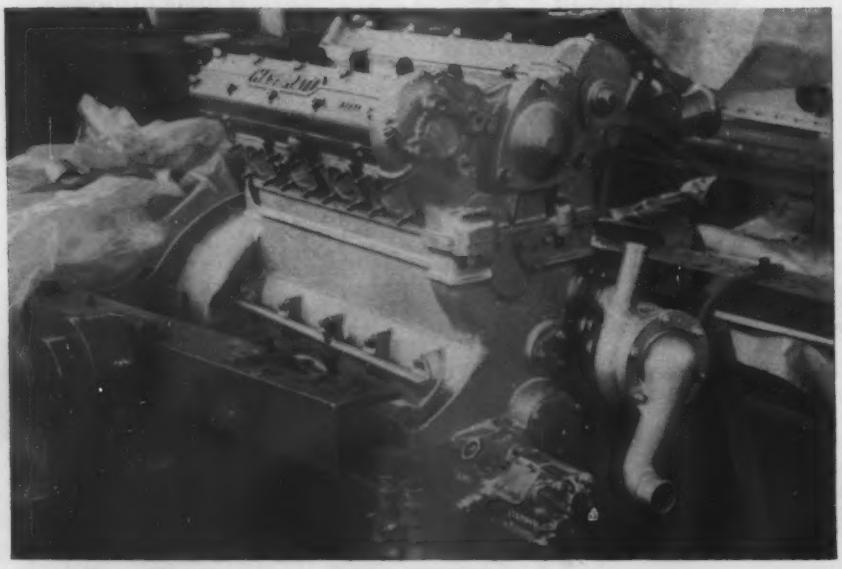
The four-cylinder unit for sale to car builders, and for use in the projected for-sale Formula 1 Maserati, is retailing for about $5000. This unit uses the Type 60/61 block and cylinder head, the latter having modified distributor and accessory drives to make it suitable for installation in the rear, like the engine of the Type 63.

Bore and stroke are 81 x 72 mm, just the same as the original 150S Maser of 1955. That engine had 40 mm Webers while the new one has 45 mm carbs. On a compression ratio of 10 to one the new unit delivers 165 bhp at 8500 rpm. At this engine speed its corrected piston speed is 4250 feet per minute, almost exactly the peak piston speed of the Type 61 which uses the same identical bottom end.

Though the 150S engine weighed 308 pounds, and its 200S brother 330, the new F.1 four weighs only 286 pounds – modest but heavier than Ferrari's latest 120° V6.



New Maserati F.1 four-cylinder engine has new sump casting for vertical mounting. Drawing above guides customers in locating the mounts.



PRESSAUTO

AUSTRALASIAN GRANDE EPREUVE?

If top racing officials in Australia and New Zealand get their way, an Australasian G.P. will be added to the international calendar in 1962 or 1963.

Both countries have shown they can draw enormous crowds to international events and plans have been drawn up to stage an Australasian Grand Prix which the organizers hope would count in the world championship.

W. H. Knox, president of the New Zealand Grand Prix committee, has set the ball rolling by applying to the FIA for Grande Epreuve status for the 1962 N.Z. event.

After discussions with Geoff Sykes (secretary of the Australian Automobile Racing Company), it is expected that a similar application will be made on behalf of an Australian or a possible Australasian G.P. for Sydney's new circuit at Warwick Farm. This circuit is patterned after Aintree and is used for both horse and car racing.

Any Australasian G.P. will be for Inter-Continental machines and not for F.1.

Undoubtedly motor racing is tremendously popular down under. Moss and Brabham together drew 65,000 people at the "Farm" and the 1961 New Zealand Grand Prix saw an official attendance of 65,000.

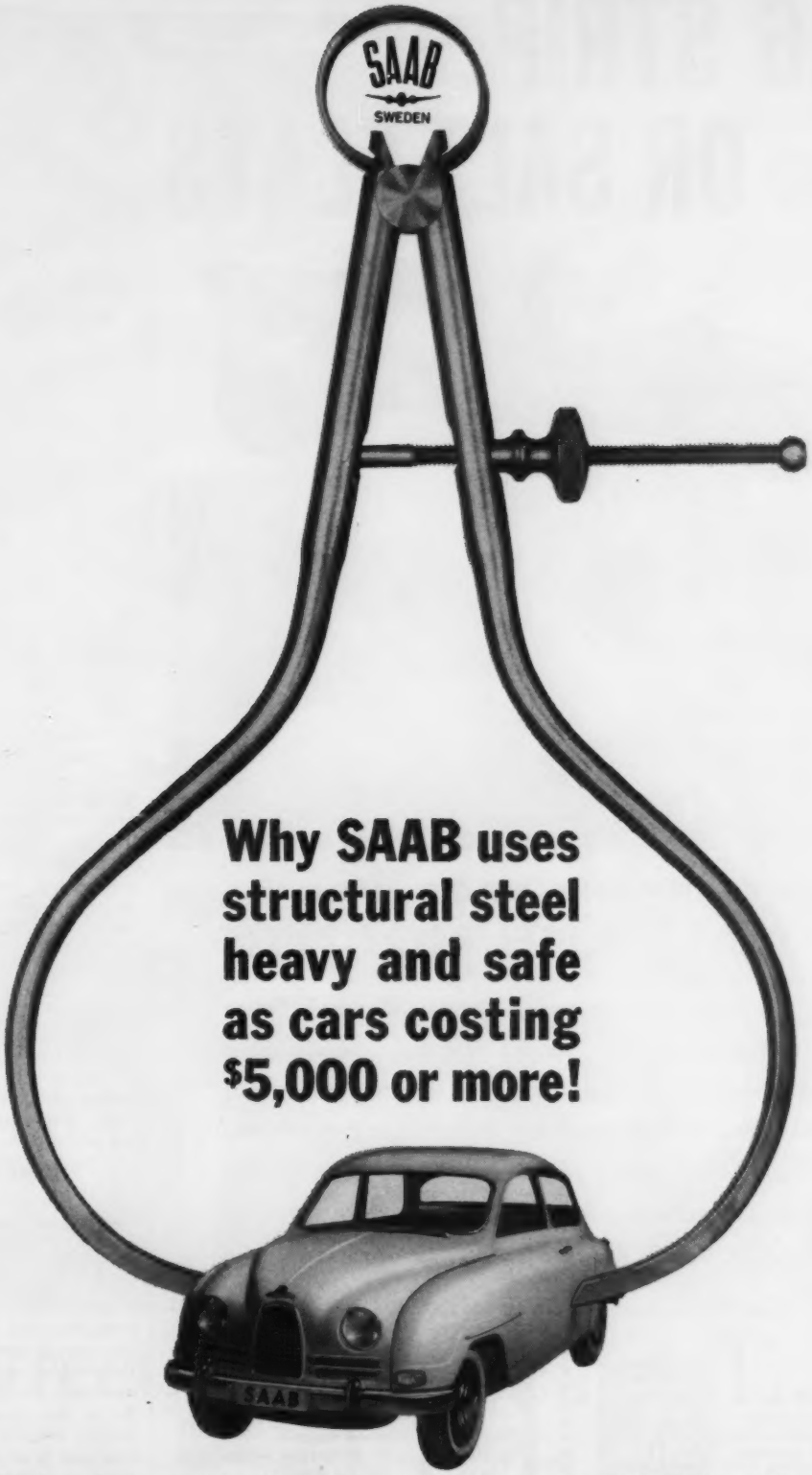
Even the small circuits are doing well. On opening day at Catalina Park (at Katoomba, N.S.W.) some 15,000 saw John Marsden win the main event with a special powered by a Vincent HRD motorcycle engine. On the same day 25,000 saw Dan Gurney (BRM) win at Ballarat, Victoria.

NO COMPROMISE FOR COOPER

Having just spent an afternoon with John Cooper, the formal announcement of his Indianapolis entry (reported last month) came as an exciting surprise. Cooper and Brabham's interest in the race had sharpened intensely following the shattering October trials at the Speedway. Looking at the calendar, we see that there is just one week between the Dutch Grand Prix on May 22 and the Indianapolis 500 on May the 30th. With the Monaco G.P. on May 14, Jack Brabham will undoubtedly have to make two trips across the ocean in order to appear for Indy qualifying as well as the race. These two Championship dates have always clashed and it's fortunate that in 1961 there happens to be a practical gap between a European G.P. and Indy. On the other hand, Brabham *may* sacrifice one or more European races and turn his entire attention to the American classic.

The Cooper-Climax Indianapolis entry will not be a compromise. There is no intention of using a Formula 1 car, half-

(*Continued on page 20*)



The Swedish SAAB is the safest compact on the road, by design. Heavier gauge steel and unitized construction give the car enormous integral strength. Steel panels encased in the windshield pillars, and throughout the body, girdle the car in a wall of steel. (SAABs weigh up to 300 pounds more than cars of comparable size). SAAB Front Wheel Drive gives you extraordinary traction as well as safer, responsive steering. It does not shake or sway even at speeds of more than 70 MPH. The car accelerates 0-50 MPH in 14.6 seconds, far ahead of other foreign compacts, for safer passing on hills and highways. This remarkable engine has only 7 basic moving parts — one reason why SAABs commonly go 100,000 miles without major overhaul. So if you are considering a car in the under $2000 range, see and drive the smartly styled 5-passenger SAAB. Send for Free, fully detailed SAAB Manual. Section B, SAAB Motors, Inc., 405 Park Avenue, New York 22, New York.

(Continued from page 18)

way set up for Speedway requirements. John points out that the car taken to Indianapolis last October competed at Watkins Glen the following weekend, and the same machine in which Jack did 144 mph at Indy put up an equally good show at the Glen. With a chassis specially prepared for the 500, higher exit speeds from the corners as well as improved braking will be possible. The four-cylinder Climax, bored out as far as possible (to 2750 cc) and running on alcohol, will be tilted to the left instead of the right as it is in the Formula 1 car. John expects the powerplant to push the tiny Cooper along at 150 mph. The chassis will be lengthened by five inches and the resulting improved weight distribution related to the Indianapolis track should give Brabham a highly competitive weapon. Sixteen-inch center-locking wheels as well as special Dunlop rubber will, of course, be required, so don't be surprised to see Dunlop seize the opportunity to develop an Indianapolis tire.

Cooper will also soon have a revised Monaco sports car for 1961. Its dual wishbone and coil spring rear suspension is as on the current Formula 1 car, but the rest of the machine will be almost identical to last year's car.

PORSCHE PRODUCTION SPEEDUP

By entering into an agreement with two additional body-builders, Porsche plans a 60 percent increase in production this year. Karmann in Osnabrück and de Jeteren Freres of Brussels (assemblers of 30,000 VW and Studebaker bodies in Belgium annually) will soon be building Porsche coupes which up to now have only been coming off lines in Stuttgart. Drauz of Heilbronn will continue to build the roadster bodies. Ferry Porsche does not want to exceed a production figure of 50 units daily thereby retaining the unique character of the automobile. Incidentally Reutter, who has been the sole Porsche body constructor, provided Professor Porsche with his first VW chassis 20 years ago.

Porsche is reported to be developing a completely new car for introduction in 1962. This exciting prospect will probably be powered by a completely new engine.

MORE SEAT BELTS USED

Safety belts are becoming more and more common on European automobiles. With over-the-shoulder arrangements standard equipment on home market Volvos, belts are now being seen on English cars as well, with Rootes the latest to offer a single strap diagonal belt as a factory accessory. Germany is also getting into the act. The Federal authorities in Bonn are formulating standards for belts in Germany and West Berlin that correspond closely to those of Sweden and the United States. A minimum belt width of two inches has been laid down and each belt must be able to stand a load of 3970 pounds (1800 kg). In order to pass the rigorous testing procedure, all belts must be able to stand up to the specified load requirements within a temperature range of —40°F to +104°F after being soaked in water for two hours!

Without comment, we will simply report that Belgium, the last European country without driver's licenses, will begin to require them. *C/D*

Main Street...Turnpike...or Track...

"Shop and go" driving starts to be fun in a TRIUMPH TR-3. You'll find its quick responses make light of heavy downtown traffic. Its nimble handling makes parking a snap... and there's ample room for plenty of bundles just behind the front seats, or in the large lockable trunk.

The TR-3's 100 horses love exercise. And high-speed thruways won't tire them *or* you. The TR-3 is built to take car-killing road competition. It is surprisingly *comfortable*, too. Solid suspension and contour seats combine to make the miles enjoyable.

The TR-3 has taken first-in-class in practically every major European rally during the past five years. Special competition equipment for the TR-3 is available through over 650 TRIUMPH dealers. Today call your local TRIUMPH dealer for a test drive!

America's #1 sports car value

TRIUMPH TR-3 ONLY $2875*

*U.S. Ports of Entry, plus state and/or local taxes. Slightly higher West Coast. Overseas delivery available. Standard-Triumph Motor Co., Inc., Dept. F-51, 1745 B'way, N. Y. 19

PIPELINE

"People kept telling me, 'You can't go to Mexico in that.' I can go around the world in it! They told me I'd get run over in three days."

William Glen Davis 1st, world traveler and raconteur, mooched his second cigarette. He looked at ease as he sat in our New York office, his tanned bearded face beaming as he described his ride from Los Angeles to New York by way of Mexico City and Nassau—on a kart! He wore cotton pants, a summer shirt with a blue scarf around his neck; his galoshes seemed incongruous, but they were a practical piece of gear as he had finished his trek in New York's worst pre-winter snowstorms.

Born in San Mateo, California, the 22-year-old submarine veteran told his story. It started when he was 12 and bought a '32 Chevy, using a borrowed learner's permit to get his license. After his hitch in the Navy, he had been "living on the beach" in the Los Angeles area. He thought he'd like to take a trip, but not just any trip—something, uh, unusual. "I thought maybe I'd go by pogo stick, or kayak or canoe to Alaska or someplace like that. Then I saw a kart go by on a car and, ah ha, that's the way right there." So William Glen Davis 1st got in contact with the Echo Engineering Co. in Los Angeles and secured one of their karts. He's touring as the firm's National Representative.

It took him 22 days to travel the 2000 or so miles from L.A. to Mexico City. From there he drove to Miami where, he says, he stowed away and went to Nassau for Kart Week action. He says he averages 250 miles a day in good weather and can cruise at 60. To date his main trouble has been with clutches.

He says police officers sometimes stop him, but more from curiosity than anything else. He carries his gear in a trailer behind the kart, sleeping out most of the time in warm climates. He said he had had more trouble driving from Richmond, Virginia to New York than anywhere else, because of the heavy snow in mid-December. He says, "I go faster than most cars on the Turnpike when it's icy; I've never been so cold in my life."

Davis has been living on people's hospitality. He said karting enthusiasts in particular have been most helpful in their assistance. He noted he started with $20 and now has more than that.

His drive to New York ended abruptly in New Brunswick, New Jersey where patrolmen prohibited him from driving on the Turnpike, so he put the kart on a truck to finish the trip. But as far as he's concerned it's not over yet. He plans to drive around the world, with a krosskountry kart trek of Europe his immediate aim. But he needs support and asked us to ask the readers of C/D if they'd give him a hand, either financially or by supplying possible stopover points in Europe. We'll forward any mail sent to him care of CAR AND DRIVER, 1 Park Ave., New York 16, New York. Davis estimates he will need about a year and a half to circumnavigate the globe. Shortly after his visit to C/D, he encountered cartoonist Stan Mott who agreed to accompany him on a Blitz kart and to report on the progress of the Grand Tour.

What about the prediction that he'd be run over in three days? He says people still ask him "How many times have you been hit? And I say, 'Oh, about five times —I've been killed about two times!' Actually, I've had no close calls at all." And what does William Glen Davis 1st expect to accomplish with his trip around the world, knowing no language but English? "I'll bet when I get done I'll know all the world's cuss words."

(*Continued on page 24*)

Porsche is performance! Porsche is pleasure! Porsche is a masterful blend of power—comfort—and elegance often copied but never equalled. Why not drive one and discover for yourself what we mean when we say, *"All it shares with other cars is the road!"*

PORSCHE

Dealers from coast to coast in U.S. and Canada.
Porsche of America Corporation,
527 Madison Avenue, N. Y. 22, N. Y.

(*Continued from page 22*)

The **Classic Jaguar** Association will welcome owners of Jags of the Mark V or earlier vintage, including SS types. According to Richard T. Trenk, temporary membership chairman of the CJA, some 926 Mark V's were sold in the U.S. and another 350 in Canada. The CJA will offer technical assistance to members in addition to holding such events as concours, tours, shows. If you cherish your classic Jag, get in touch with Mr. Trenk, 1450 Boeger Avenue, Westchester, Illinois.

Jim Hurturbise who set a record qualification mark of 149.6 mph at Indianapolis last year will be guest of honor at a dinner May 24 in Indianapolis. The dinner, given by Monroe Auto Equipment Company, will cite Hurturbise as **"Rookie of the Year."** Sharing the spotlight with Hurturbise will be Lloyd Ruby, Bud Tinglestad and Wayne Weiler, fellow rookies who qualified for last year's 500 plus the top ten finishers of the '60 race. Monroe, whose shock absorbers have been used on the last eight winners at Indy, plans to make the dinner an annual event.

A first aid kit to **slip over the sun visor** of your car is being offered by the Medical

Supply Company, Dept. C/D, Rockford, Illinois. Designed to keep emergency equipment at hand when it's needed, the kit is priced at $3.95.

Revised regulations, 52 pages of them, have been issued by the Automobile Club de L'Ouest for the running of the 29th Grand Prix D'Endurance, **Les 24 Heures du Mans June 10 and 11.** Among the changes — a bit of loophole plugging, eh, Mr. Maserati? — is in article 33. In addition to requiring the 25 cm-high full-width windshield as last year, it states that the glass of the windshield must be affixed at an angle of 30 degrees, the angle measured along two vertical planes passing through the center line of the two seats. Almost as interesting as the racing, it seems, is the finding — plugging — and counter-finding of loopholes in the rule tome.

The ogle-eyed trademark of Dean Moon seems to be transfixed on the needs of performance-minded drivers. Among the latest offerings from the California specialist in fuel systems and accessories are **Corvette roll bars** and **foot pedals** for just about any car.

The legend "Moon Equipped," you may recall, has graced units on such cars as the Martin Ts which were written up in SCI. Attractive, serviceable fuel tanks have long been a Moon standard, but Corvette owners in particular will hail the Moon roll bar for their steeds. Available in plain, cad-

(*Continued on page 26*)

Chrysler Newport—A new, lower-priced Chrysler with a 361 cubic inch V-8 "tuned" to regular gas.

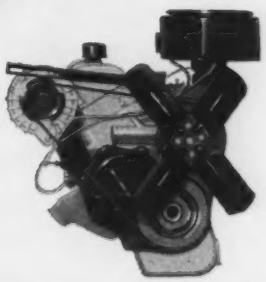
"Fill 'er up with regular"

In 1961 you can get a Plymouth, Valiant, Dodge, Dart, Lancer, or Chrysler that runs fine on regular gas

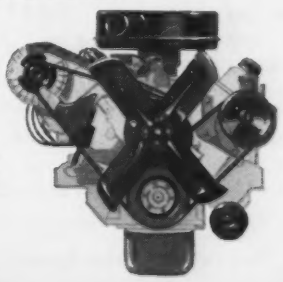
Standard on every 1961 Chrysler Corporation make of car except the Imperial is an engine that puts out its best on regular gas. There's the new Economy Slant Six that wrings 20% more go out of 15% less gas than our previous sixes; and a variety of V-8's including a big 361 cubic inch power plant.

And these cars save important pennies and your nerves with other good things, too. Like 7-soak rust-proofing that protects looks and resale value. The amazing Alternator that keeps your battery charging even when the motor's idling. And strong, silent Unibody Construction that quiets squeaks and rattles while it adds head, leg, and hip room.

Someday other cars will probably have their versions of these good things. But why wait? You can have them all, right now, as standard equipment in the 1961 Chrysler Corporation cars. And you won't have to pay any more for these cars than for similar models of other makes. See your dealer.



New Economy Slant Six, above, is standard in the compacts with a larger version available for most Plymouth and Dart models. V-8's, designed to use regular gas are available for Plymouth, Dart, Dodge, and Chrysler models.



Chrysler Corporation

Serving America's new quest for quality

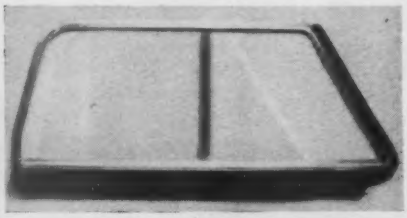
Plymouth Valiant • Dodge Dart Lancer • Chrysler Imperial

(Continued from page 24)

mium or chrome-plated steel, the bars have wrinkle-free bends. Some unfortunates have inadvertently tested the strength of the bars by inverting their Corvettes and can attest to their mettle (metal?). Kits may be purchased with or without the vertical support bars.

Along with the pedals, which replace clutch, accelerator and brake units (they're made of metal and may be had in foot-contoured styles), the Corvette roll bars are available from the Moon Equipment Company, Dept. C/D, 108 South Norwalk Blvd., Santa Fe Springs, California or Clembert Equipment, Dept. C/D, Hamden, Conn. Another aspect of the versatile Moon's role in the current speed scene was described in the July, 1960 SCI in a story on the "Moonbeam" Bonneville car....

Tight sealing, attractive, durable **sliding side curtains** are among the many items



being featured by Bakers Worldwide Auto Parts. Made of polished aluminum, the side curtains have heavy rubber gasketing to prevent leaks both of air and water. Fogged windshields should be at a minimum with the controlled ventilation offered by the sliding plastic sections. They range in price from about $70 to $89.95. Other items of interest to enthusiasts include a wide range of luggage racks, grille guards, mufflers and tops. It would take us almost a complete **Pipeline** to list all the goodies, but one more seems noteworthy. It's a straightening and re-chroming service. Just send in your old bumper and get it back like new. Full details may be had by contacting Bakers Worldwide Auto Parts Inc., P.O. Box 57, Dept. C/D, Franklin Square, New York.

Taking some fast laps around the bookshelf two tomes that caught our eye were about racing (natch). One was Brock Yates's **"Famous Indianapolis Cars and Drivers"** and the other was **"Le Mans"** by Louis Klemantaski and Michael Frostick. The 219-page Yates book is a very readable history of some of the cars and drivers that gave Indy its place of preeminence in American racing. Illustrated with numerous photographs, the **big days at the Brickyard** are faithfully recorded. These include the saga of the first race there, the tale of Ralph DePalma pushing his big Mercedes across the finish line and the virtual capture of Indianapolis by A. J. Watson machines. Harry Miller's fantastic cars are brought back to life and the tale of the Murphy Special, the first and only American car to win a European GP (1921 in France), the first car to win a major continental race with a straight-eight engine, the first racing car to use four-wheel hydraulic brakes and the first car to win the 500 with a Miller engine. Definitely on the recommended reading list, "Famous Indianapolis Cars and Drivers" is published by Harper and Brothers, New York and sells for $3.25. Yates, a contributor to C/D, also penned "The Indianapolis 500."

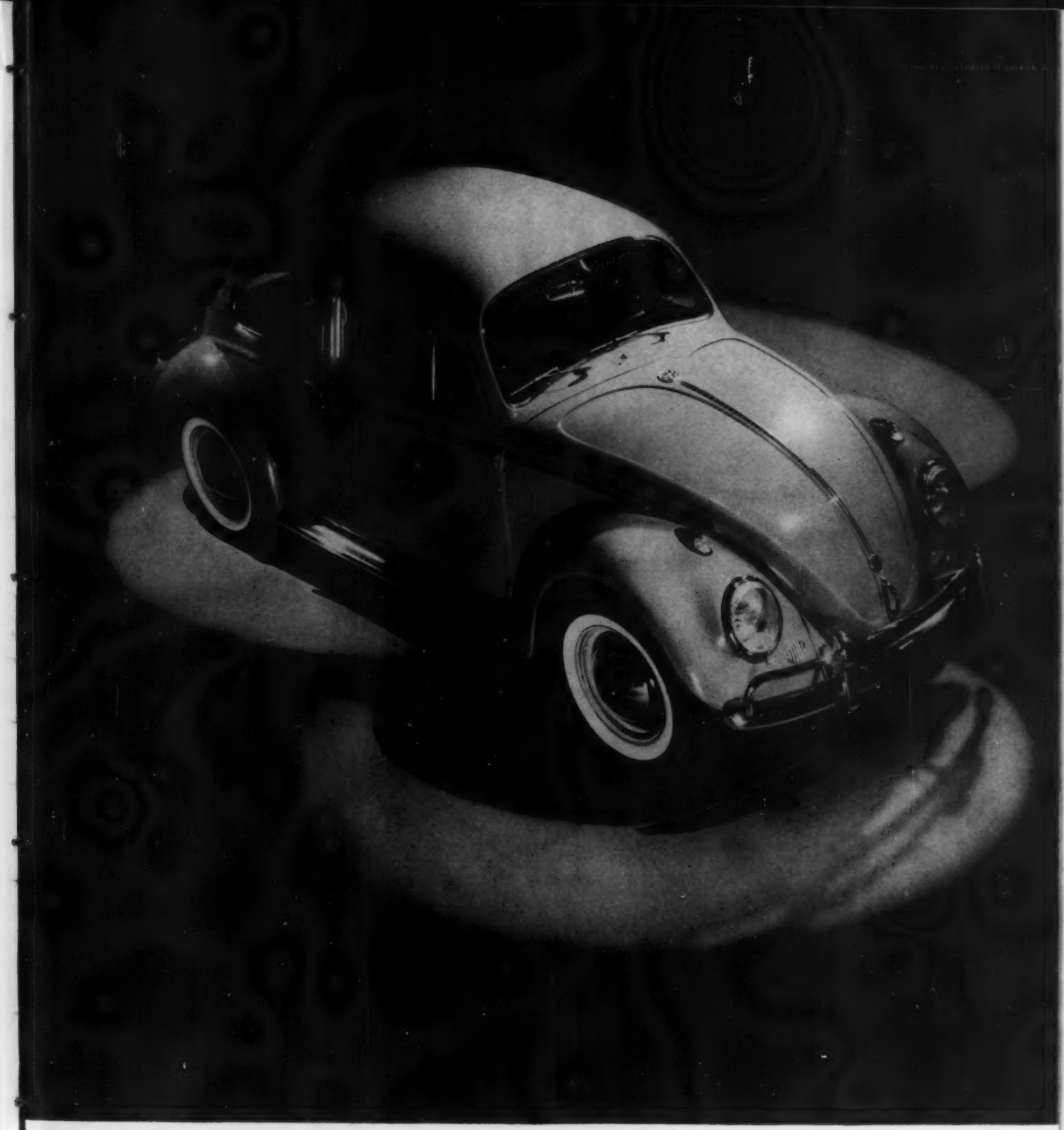
While the Indy 500 holds an unrivaled reputation for being tough, Le Mans is the longest race in the world. To the vast majority of sports car enthusiasts, it is *the* sports car race. The cars and drivers are always firmly impressed in the minds of spectators long after the discomfort of lack of sleep (and quite probably rain) are forgotten. Klemantaski and Frostick, who collaborated on "Motor Racing Circuits of Europe" and "The Vanwall Story" present in "Le Mans" (63 pages, The MacMillan Company, New York, $4.50) a fastidious selection of the cars and drivers that have helped perpetuate the fame of the great French race. In addition to a chart presenting graphically the rise of race average speeds, the authors, through a great many photos and well-chosen text deal with such topics as Pits and Personalities, the Jaguar and Aston Martin records and such types of cars as the **Monsters, Midgets and Curiosities.** The selection of material includes some dating back to the inception of the race in 1923 and continues through the 1960 event. Primarily a photo book, "Le Mans" offers plenty of material for the discussions that are bound to occur among bench racers after the checkered flag drops this June. However, we noted an error about an American entry. The C4R Cunninghams are consistently described (in error) as C5Rs. Nevertheless, it's the kind of book that will make you want to see Les Vingt-quatre Heures for yourself.

Changes in regulations for the **Indianapolis 500** have been announced. Among these is one requiring rookie drivers to pass drivers' tests at speeds up to 135 mph, an increase of 5 mph over last year. SCI gave a run down on the testing procedure in the January issue in the story Brabham Attacks the Bricks. Prize money, always in abundance at Indy, has been increased to a **guaranteed $150,000.** The former guaranteed $75,000 has become "obsolete" according to Speedway directors. For at least the past 15 years, Indianapolis has always paid more than the guaranteed figure. Just for an example, the '60 race paid prize money totaling $369,150.

Mercedes-Benz 220 SE cars claimed first and second places in the **7145-mile Algiers-Central Africa Rally.** The winning car,

shown above on one of the smoother sections, was piloted by Karl Kling and Rainer Gunzler. Citroens earned third and fourth places and another Mercedes came in fifth.

In addition to offering the full range of Abarth mufflers, Fisher Products, Dept. C/D, 21-25 44th Drive, Long Island City 1, New York has **extra gauges.** Among these are water temperature gauges for Fiats priced at $8.95 for the 1100 and 1200 and $10.95 for the 600; a combined fuel-oil temperature guage for VWs at $29.95 and an indoor-outdoor thermometer at $9.95.



The '51 '52 '53 '54 '55 '56 '57 '58 '59 '60 '61 Volkswagen.

Ever since we started making Volkswagens, we've put all our time and effort into the one basic model.

You can see we've had lots of practice.

We've learned to make every part of the VW fit every other part so well, the finished car is practically air-tight.

The engine is so carefully machined and assembled, you can drive a brand new VW at top speed all day.

We don't make changes lightly. And never to make the VW look different; only to make it work better.

When we do make a change, we go out of our way to make the new part fit older Volkswagens, too.

With this result: An authorized Volkswagen dealer can repair any year's Volkswagen, even the earliest. (Why not? They use mostly interchangeable parts!)

If you had to decide between a car that went out of style every year or two and a car that never did, which would it be?

TECHNOTES

SPRITE TIPS

Allow me to compliment you on a thorough and well-written Road Research Report on the Sprite in your April, 1961 issue. I have a 1959 Sprite and I find a few points of conflict with your article, however.

First, the heater switch. Pulling it closes the air ducts, rather than opening them. Second, according to your dashboard diagram, my speedometer and tachometer are reversed.

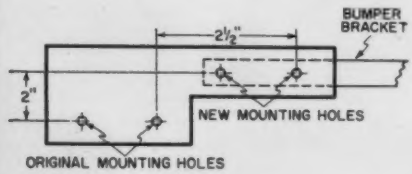
Some other owner tips. Cut 2 inches off the stubby little shift lever. This increases knuckle clearance at the bottom of the dashboard, and actually makes shifting easier.

After buying a dozen or so new front parking light lenses and a new grill, I made an adapter out of ½-inch steel plate. Two small notches are required in the bottom of the hood.

This moved the front bumper out 2½ inches and raised it 2 inches. It looks a little odd at first, but you soon get used to it and you no longer have to buy new lenses by the gross.

As far as warmup difficulties in the winter, buy a window shade and 6 feet of brass chain and install a blind. This is quite simple and cheap, and is much more efficient than a piece of cardboard.

T. J. Finn
Cleveland, Ohio



According to the owner's manual, you've got us dead to rights on both your criticisms. On the car tested, there was certainly some air coming through (warm, fortunately) when the knob was pulled out. It was so cold most of the time that we can't really recall what things were like with it pushed in but not turned on. Maybe more air would blow in then. Moral: from now on we'll read the manual more carefully. As to the transposed tach and speedo, we're the ones who are reversed. Guess we were dazzled by all those reflections. (We must admit to making the same error with the Facellia in the February issue.)

Another error is the Sprite's rim size. It should have read 13 x 4J, not 15, especially if one expects to fit the 5.20 x 13 tires.

Thank you very much for your generous and detailed suggestions for fellow Sprite-owners. We will be delighted to print as many similar tips as readers send us. But please make sure they're ones that work!

(Continued on page 30)

THE **MERCEDES-BENZ 220SE** CAN DO THINGS OTHER CARS CANNOT

This picture demonstrates a very unusual feature of the Mercedes-Benz 220SE. (E means Einspritzmotor...fuel injection.) Unlike most cars, Mercedes-Benz has four-wheel independent suspension for safer cornering and greater comfort. Moreover, its rear axle (a swing axle) employs a horizontal spring, perfected in racing for cornering. The 220SE can keep its equilibrium when other cars start to slide.

There's something else the 220SE can do for you and your passengers. It adds, to the creature comforts and spirited performance of the car, the indefinable pride of motoring behind the silver star of Mercedes-Benz.

MERCEDES-BENZ SALES, INC.

SEE MERCEDES-BENZ CARS AT YOUR NEAREST DEALER

WE CAN ALSO ARRANGE FOR 1961 EUROPEAN DELIVERY. WE WILL SERVICE YOUR CAR ON YOUR RETURN HOME.

MERCEDES-BENZ

DIAMOND JUBILEE

75TH YEAR

1886–1961

(Continued from page 28)

SIMCA PLUS VOLVO=GO!

I own a '58 Simca Aronde. I'd like to install a '59 Volvo engine and transmission. Can I get the information needed to do this? Would I have a noticeable gain in speed?

Steve Spielman
Brooklyn, N. Y.

You bet you'll notice the difference! That's nearly 50 percent increase in power you're talking of (assuming, of course, that you've got your hands on the twin-carb 85 bhp Volvo and not the rare-here single carb 66 bhp model).

As to the information needed, you will find yourself mostly on your own as early-birds usually are. The Volvo engine is a little bigger and you may have to shift things about a bit to get it in. Examples are steering column, box and linkage (beware the latter); radiator, engine mounts and throttle and choke controls.

As you can tell, we haven't checked this one out personally nor do we know of anyone who has. What you must do is take a measuring tape and a sharp, keen eye and apply them in turn to the automotive objects of your affection. Be sure to check the tail-shaft on the Volvo gearbox for compatibility with the Simca's driveshaft. If it's not, when you shorten the latter, you may use the front end of a Volvo shaft. But DO use the Volvo box to handle the greater torque.

AUSTIN-WIGGLY

My '57 Austin-Healey tends to "dive" from side to side when it encounters rough spots in the pavement such as the raised areas that develop at cracks in an asphalt road.

Mechanics I've consulted have suggested replacing (1) the somewhat worn front tires, (2) the slightly tired front shocks, or (3) adjusting the caster angle.

The wire wheels have been recently overhauled and the front end aligned, both to no avail. Have you any suggestions?

Richard A. Hollern
Madison, Wisconsin

Replacing tires and shocks when they become "somewhat" worn is always a good idea anyway, though determining "when" is a matter between your checkbook and your conscience. I don't see how changing the caster angle is going to make your Healey stop doing something other ones don't do. Besides, it's not readily changed.

Try this: Check your entire steering system and eliminate all *play, whether it's in the steering gearbox, the kingpins or at the steering arm balljoints. If adjustments aren't able to completely eliminate play, start replacing the offending parts. In the future, be sure to grease the chassis frequently, also after driving in heavy rain. (Grease can be washed out, you know.)*

CORVAIR MONZA—WHICH RATIO?

I'm planning to buy a 98 bhp Monza with four-speed transmission but I just can't make up my mind which axle ratio to order, the 3.27, 3.55 or the 3.89. Can you, please, estimate the top speed, zero to 60 time and economy for each of them? Thank you.

Gordon W. Banks
Montreal, Quebec

Ouch, you're asking us to stick our necks right out on the chopping block. After all, the state of tune of individual engines has something to do with these figures too. Here we go. Based on the car tested last month which has the shortest gears, the 3.89-to-ones, we've worked up the table below:

	3.27 estimated	*3.55 estimated*	*3.89 observed*
Top speed	*99*	*97*	*95*
Zero to 60	*16½*	*15¾*	*15*
Mileage	*19-25*	*18-23*	*17-21*

But remember, these are only estimates. No doubt there are 3.27-equipped Monzas which will get less mileage rather than more due to poor tuning or dragging brakes, etc. Generally though, shorter (numerically higher) ratios give better acceleration, especially in top gear.

UNPADDED DISCS

I've had to replace the inboard pads on the front discs of my Healey 3000 after only 15,000 miles. The mechanic told me that normally they last more than twice that. He said mine wore out from the dirt and grime thrown up by the front wheels.

Other than hiring someone to walk along in front of me sweeping the road with a broom, what can I do? I do not exactly relish the thought of replacing the pads every 12 to 15,000 miles.

George Johnston
Somers Point, N. J.

This is one the factory's already caught. Drive, don't walk, to your nearest Healey dealer and ask for kit number HAC 15 ($7.80). It's a pair of protective shields for front disc brakes.

Johnny Mantz, National Stock Car Champion, blasting through a water-barrier at Kingman, Arizona, Test Track.

Test Driver Johnny Mantz proves it for himself!

IT GOT A BATH AT 80 MPH ... and the chassis lube stayed put!

"I'm on the big two-mile dirt test track at Kingman where they torture Fords... getting ready to take a bath in a Galaxie at 80 mph. I come out of the turn and down the long chute and then sight the water -- a mean-looking pool just ahead. Then whoosh! I'm in it -- and through it -- as water blasts at the suspension, and rough desert sand tears at the ball joints. I brake down to a stop and we hoist the Ford. Everything's like it was. The sealed ball joints are intact -- the moly grease is still there even after a sand and water blasting that would wash most front ends dry. No wonder this one goes 30,000 miles between lube jobs!"

Johnny Mantz

THE '61 FORD!

BEAUTIFULLY BUILT TO TAKE CARE OF ITSELF!

FORD DIVISION, Ford Motor Company,

RELLI means tires. A complete range of specialized tire types in sizes to fit all European and most domestic passenger cars.

Pirelli does not make any so-called second or third line tires. Each of its tire products is the realization of a complete concept of performance, whether it be the kind of traction that gives lightweight cars a solid grip on the road — or the speed-plus-safety formula that expert drivers have come to depend upon in "slides" and "drifts." In every case it is the specific car and driving pattern that should determine the proper tire equipment.

Your Pirelli dealer is a tire expert — a man who will be glad to help you work out a tire prescription that's right for your car. He can tell you about Rolle, Stelvio, Cinturato, Inverno, Supersport and how each of these tires differs in rubber compounds, casing construction, tread pattern and performance characteristics.

Drive in and have a talk with him without obligation, or write to: Pirelli Sales, Incorporated — 60 East 42nd St. — New York 17, N. Y. • In Canada: Pirelli — Dominion Square Bldg. — Montreal

Test driver Norman Dewis has reason to look pleased. Geared right, this new production two-seater will wrap the needle off the dial of its 160-mph speedo! Read the details in C/D's exclusive tech report.

JAGUAR'S SENSATIONAL XKE!

by Jesse Alexander

► This is the most exciting sports car news of 1961. In late January, Jaguar Managing Director Sir William Lyons gave the go-ahead to plans to announce the XKE at New York's International Automobile Show. With countless miles of racing at Le Mans and road testing at England's MIRA proving ground, Jaguar is finally building a sports car directly descended from its competition experience. The 150-mph XKE will be available in closed or open form, both models powered by the 265 bhp, 3.8-liter XK six-cylinder engine. It will be no surprise to anyone if a team of XKE roadsters appears at Le Mans in June — in full-race trim.

At the moment, the Coventry factory is in an unusual and envious position among British car manufacturers. Bill Lyons's firm is practically the only one in the U.K. enjoying full production and an ever-increasing demand for its cars that it is never quite able to meet. While larger English factories go onto two- and three-day weeks and management bends over backwards to keep labor happy, Jaguar production lines hum. Every effort is made to increase capacity. But the Jaguar story — the Bill Lyons story — has always been like this, and he is now about to write one of the most exciting chapters of all.

Rumors about the XKE have been flying for months. When Briggs Cunningham entered one of the prototypes at Le Mans last year, tongues wagged even harder, and it was thought that its introduction was imminent. In actuality the Cunningham effort at Le Mans set the XKE announcement back several months, for this car that Briggs "borrowed" from the experimental shop was an important test vehicle, incorporating most of the features now introduced on the XKE. Driven by Walt Hansgen and Dan Gurney, it suffered from several weaknesses — mostly in the handling department — and eventually succumbed to engine trouble associated with the fuel injection system on the experimental engine. Its later experiences in the U.S., again driven by Walt Hansgen and entered by Briggs Cunningham, were no happier.

But the tale of the XKE begins not at Le Mans last year. It began with the racing D, the car with which British drivers (notably Mike Hawthorn) made history at Le Mans. With the D-Type, Jaguar began gathering pages of data that relate directly to the car being shown for the first time in New York this month. One might conveniently call the XKE a "production D", but this oversimplification doesn't really do the new Jaguar justice. The ill-fated XK-SS was that, and it was a very hairy-chested, almost-full-race machine, indeed. The XKE, on the other hand, is a tractable, comfortable, high-speed, sports-touring car.

Jaguar aerodynamicist Malcolm Sayer (formerly with Bristol Aircraft) has outdone himself with the new XKE, a tribute to pure, near-perfect form. It's not beautiful from every angle, but wonderfully efficient nevertheless, and he and his staff have created a sports car that even Stuttgart will stop and look at.

The shape of the 1960 Cunningham Le Mans car is the shape of the XKE, and Sayer told me that had the regulations for last year's race not specified a full-width windshield, it would have been the "cleanest" Jaguar yet. The test program for the new car included wind tunnel experiments, with scale models as well as full-size automobiles, and one test vehicle was put in the massive Farnborough tunnel.

This is the first production Jaguar to offer full-independent rear suspension, a slightly modified arrangement of the layout used at Le Mans last year. Experiments over 2½ years included de Dion suspension on a D-Type and swing axles on a small military vehicle, but severe breakaway encountered at the rear led chief engineer Heynes to a dual-wishbone layout. The final step was the present setup, which uses the driving half-shaft as the upper "wishbone." The one-piece tubular lower wishbone is pivoted to the differential case and cast wheel carrier, while springing is accomplished by a pair of coil springs *cum* telescopic shock absorbers at both sides, fore and aft of the half-shafts. Positive hub location is guaranteed by pressed radius arms which extend forward from the outer ends of the lower wishbones to big rubber biscuit mounts on the floor pan, in a Mercedes-like manner. A torsion anti-roll bar is also supplied at the rear.

Disc brakes are placed inboard at the rear on either side of the differential, which incorporates a Thornton "Powr-Lok" limited-slip unit. The two lower suspension arms plus the differential cases are rigidly mounted to a deep, double-sided steel cross beam, which in turn is flexibly attached to the body via rubber mountings.

The Cunningham Le Mans car did not have all of these refinements, lacking especially the radius arms which brace the lower suspension arms and prevent them from flexing forward under hard acceleration. This did happen on the Le Mans car, introducing unwanted toe-in. Though mechanically complex, the XKE layout should combine precise location with sufficient sound insulation from the unitized body structure.

Front suspension of the car is virtually D-Type, utilizing beautifully slim transverse wishbones and longitudinal torsion bars as well as telescopic shock absorbers. The XKE, however, has a high roll center, obtained through the adjustment of the wishbone pivot geometry. An anti-roll bar is also fitted.

The Dunlop disc braking system on the XKE features two entirely separate systems for the front and rear discs — the failure of one circuit does not affect the other. The hand brake actuates separate pads on the rear discs.

The fact that the power unit for the XKE is the normal 265-bhp 3.8-liter engine is not surprising. This and the gearbox have been directly passed on from the XK 150S. Improved air silencing is the only important alteration to the engine, famous for its ruggedness and reliability — plus ample

(*Continued overleaf*)

XKE roadster is specially intended for racing, but will also offer an aluminum hard-top. Trunk lid latch is concealed inside the cockpit.

Wildly good-looking new coupe is the special pride of Jaguar's Director, Sir William Lyons. Side locks release one-piece hood, which hinges forward.

Lines of XKE are clearly derived from D-Type and Cunningham Le Mans prototype. This is engineering test car, heavily instrumented as shown on page 33, which has several non-production details like door handles and raised top boot. Final roadster is expected to have top that disappears completely.

SPECIFICATIONS: JAGUAR XKE

ENGINE:

Displacement ..... 231 cu in, 3781 cc
Dimensions ..Six cyl, 3.43 in bore, 4.17 in stroke
Valve gear: Chain-driven double overhead camshafts, 70° included angle.
Compression ratio ..... 9.0 to one
Power (SAE) ..... 265 bhp @ 5500 rpm
Torque ..... 260 lb-ft @ 4000 rpm
Corrected piston speed @ 5500 rpm .... 3465 fpm
Fuel capacity ..... 16.8 gallons

CHASSIS:

Wheelbase ..... 96.0 in
Tread ..... 50.0 in
Length ..... 175.3 in
Ground clearance ..... 5.5 in
Suspension: F, ind., transverse wishbone, torsion bar, anti-roll bar; R, ind., transverse link, unsplined articulated driveshaft, trailing arm.
Turns, lock to lock 2.75
Tire and rim size ..... 6.40 x 15; 15 x —
Brakes ..... Dunlop disc, inboard at rear

DRIVE TRAIN:

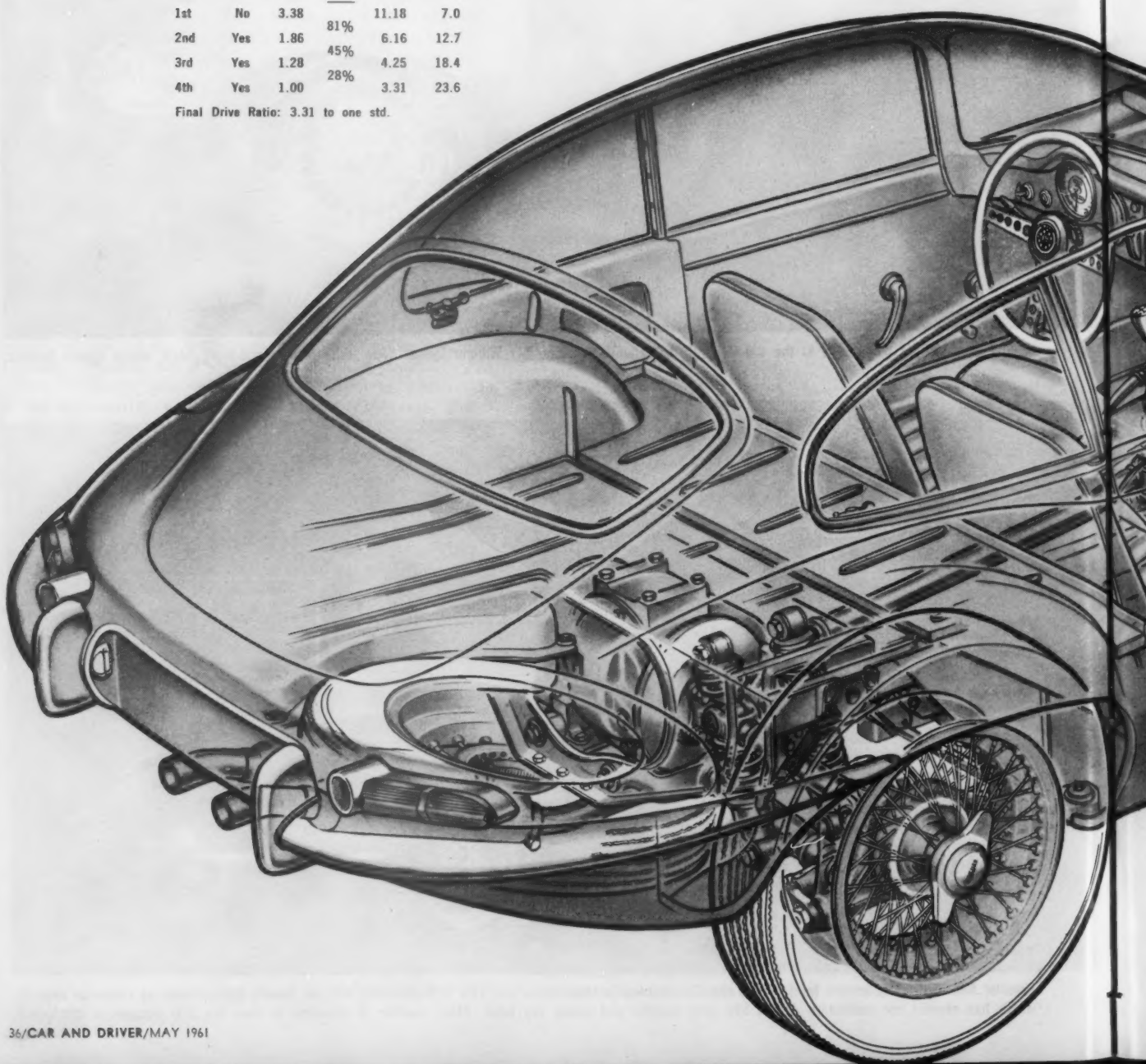
Gear	Synchro?	Ratio	Step	Overall	Mph per 1000 rpm
Rev	No	3.38		11.18	–7.0
1st	No	3.38	81%	11.18	7.0
2nd	Yes	1.86	45%	6.16	12.7
3rd	Yes	1.28	28%	4.25	18.4
4th	Yes	1.00		3.31	23.6

Final Drive Ratio: 3.31 to one std.

power when called for. Fuel injection might be an option in the future, doubtless by Lucas, but no confirmation from the factory is at yet forthcoming.

In racing trim the XK engine has been giving well over 300 bhp and if Sir William should decide to enter an XKE or two at Le Mans this year, the full-race version of the powerplant would give the car most impressive performance. The Cunningham Le Mans Jag weighed about 1960 pounds dry, while the XKE scales 2464 pounds dry in roadster form and less than a hundred pounds more as a coupe. This is on the order of 800 pounds less than its predecessor, the XK 150S, an extremely impressive accomplishment.

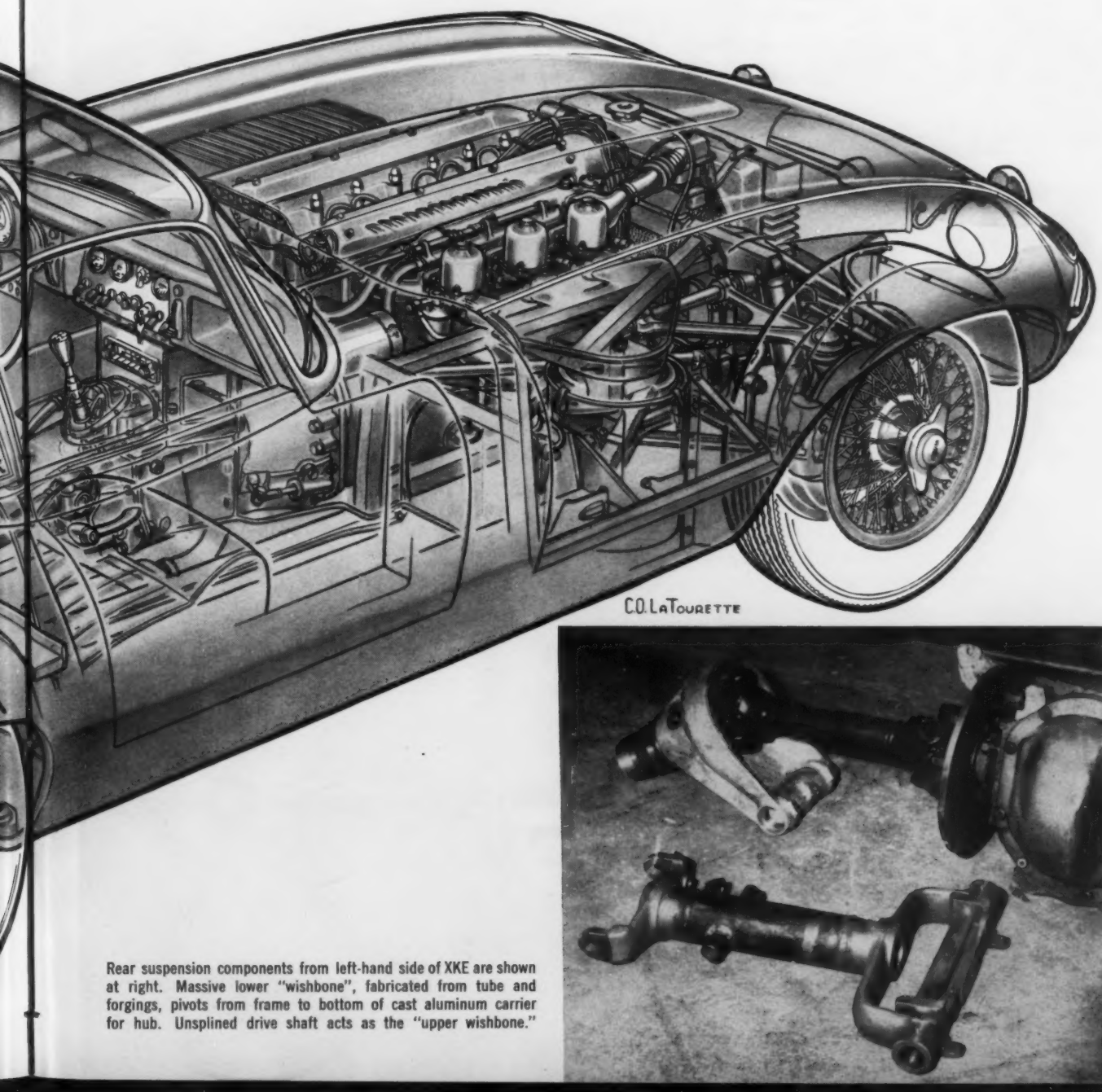
The closed version of the XKE is an entirely new type of car for Jaguar. This fast-back coupe, with its large rear door, has generous amounts of room for both passengers and luggage. A lipped package tray folds down to increase the level



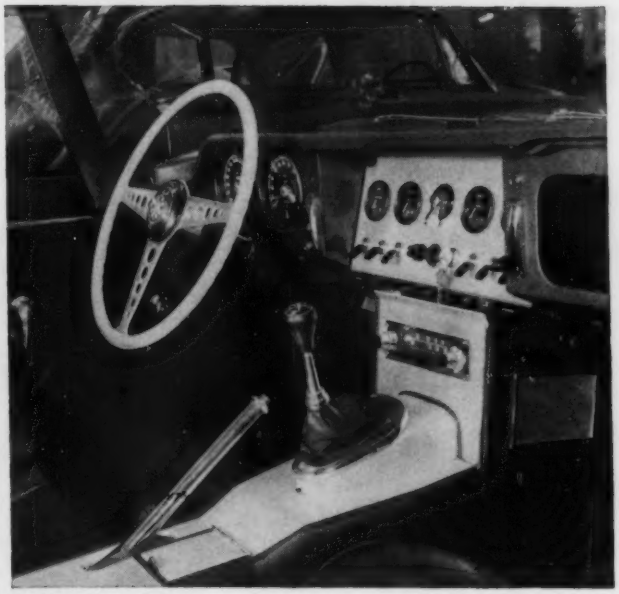
area behind the two bucket seats. Underneath the rear floor the spare tire and tools are carried. Leg room forward is excellent, despite the large transmission tunnel. The distance from windshield cornerpost to cornerpost measures 48 inches, and Jaguar engineers are the first to specify three separate windshield wipers to keep this huge expanse of glass clean. From the bottom of the windshield forward to the front of the car is 76 inches, a deliciously long hood to look over. Overall length of the XKE is just over 14½ feet, almost two feet longer than the D-Type. The two-place roadster has the same dimensions and only lacks the large luggage volume of the closed version. A removable hard-top will also be available for the convertible.

Body construction of the XKE relates directly to experience with the D-Type, and I was interested to learn from Jaguar's Bill Heynes that this type of monocoque center body section is not especially difficult to fabricate on a large scale. The fact that large panels are used makes it an easier structure to put together, and gives the car an extremely high degree of rigidity. This stiff central body assembly is welded to the brazed high-tensile-steel tubular forward structure onto which the engine and front suspension are mounted. The large forward-hinging hood is in fact three separate panels, constructed this way in an effort to reduce the cost of repairs in a minor accident. Bodies will be made by England's Pressed Steel Corporation. An aluminum body for competition might be up Jaguar's sleeve for the 1961 Le Mans race.

Jaguar has no intention of giving up racing or even showing a reduced interest in competition. They expect XKE owners to race their cars and are therefore offering three different rear axle ratios: 3.54, 3.31 and 2.93 to one. Standard will be the 3.31 ratio. Larger tires will also be an optional extra but there will be no overdrive or automatic transmission option on the XKE.



Rear suspension components from left-hand side of XKE are shown at right. Massive lower "wishbone", fabricated from tube and forgings, pivots from frame to bottom of cast aluminum carrier for hub. Unsplined drive shaft acts as the "upper wishbone."



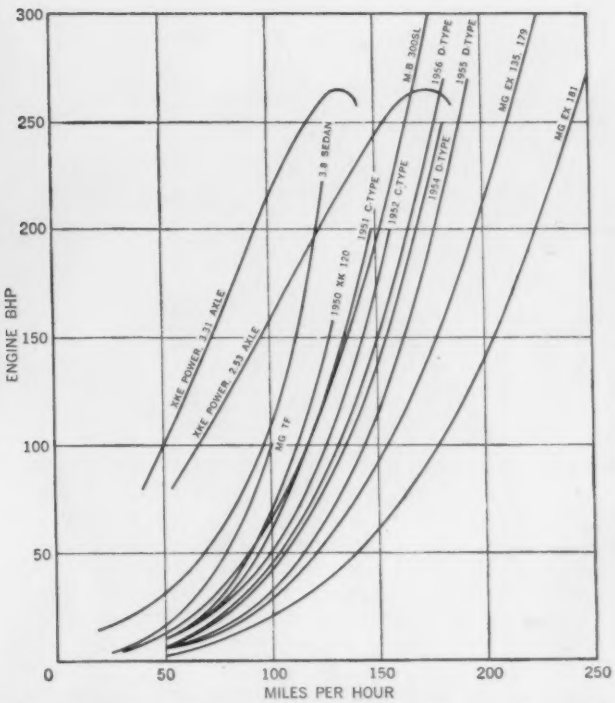
Coupe interior is lushly trimmed, though open glove box has a sketchy look. Central control panel easily swings down for access and service.

How fast is the new Jag? The speedo reads to 160 mph and test driver Norman Dewis has lapped the banked MIRA track at 150. Under the right conditions it would seem that it wouldn't be too difficult to get the needle close to its 160 mph maximum. From the aerodynamic standpoint, in fact, the car should be capable of no less than 180 mph, with 265 bhp and the right gearing, which would pretty effectively make it the world's fastest series production car today, as the XK 120 was in its time. This is a point Jaguar may decide to prove to the world's satisfaction by means of record runs in Belgium near the date of introduction.

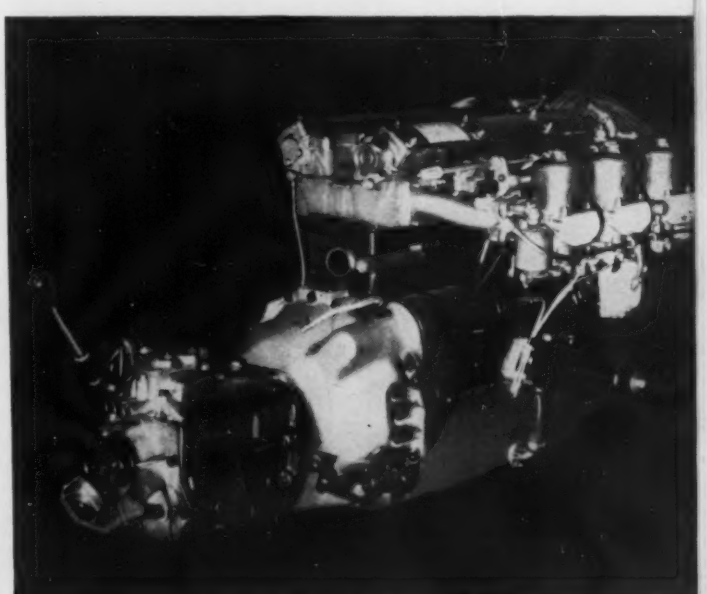
Though speed like this is seldom usable on the road, it will mean Bill Heynes has accomplished what he set out to do with the XKE roadster: design and build a real sports car which can go from the road to an international race meet with only detail changes. The new Jaguar should fit beautifully into G.T. racing, which is definitely on the way in throughout the world. For enjoyable Grand Touring on the road, all the usual Jaguar luxuries are on hand. An indicator light signals low brake fluid level or that the hand brake's applied. Seventy-two-spoke wire wheels are standard fittings. The fan is driven by an electric motor, thermostatically controlled, and the interior heating system is unusually comprehensive. The side windows wind down, completely out of the way. The center of the dash, a handsome array of dials and toggles, folds open easily to expose its back for service. Interiors are upholstered in genuine leather, over Dunlopillow foam rubber cushioning. Dual mufflers on both sides of a dual exhaust system, tucked under the center of the car, provide sophisticated silencing without losing the six-cylinder sound for which Jaguar is famous.

The specs are sensational; that such a car could be engineered is remarkable. As usual, Jaguar adds a minor miracle by selling such a machine at an incredible price. The XKE is not expected to cost appreciably more than the XK 150S, top car of the series it completely replaces! This means we're talking about $5500. What did the XK 120 cost when it was first introduced in the U.S., in 1948? No less than $4900. This fantastic growth in value, at practically the same price, is dramatic tribute to the policies of Jaguar's Sir William Lyons.

—JLA



Power curve plot with standard axle ratio indicates easy 140-mph top speed, while 2.53 gears should allow about 180, since aerodynamics are slightly better than 1956 full-windshield D-Type. Many other absorbing comparisons can be drawn from this graph of speed vs. power required.



Engine is the same 3.8-liter unit used in XK150S. Three carbs may be replaced with optional Lucas fuel injection; this isn't definite yet.

Three Red Roses in the Rain by William F. Nolan

Not all the trophies heaped upon the winner of the world's most colorful race are supplied by the organizers. Some come right from the hearts of the spectators.

• Once each year in May, inevitable as the spring mistral which scours the blue sweep of sunblazed Mediterranean, the Gods of the Road come to Monte Carlo. To the land of the roulette wheel, the Bikini and the Barbary fig is added the jungle roar of thoroughbred automobiles as the champions of the world gather to match speed and courage in the last of the great "round the houses" continental motor races, the *Grand Prix de Monaco.*

Here, several days prior to the race itself, the crack international teams assemble: Ferrari, Maserati, B.R.M., Cooper — manned by the sport's elite from England, Sweden, Australia, New Zealand, Italy, France, Germany and America.

To understand and appreciate the magic that is Monte Carlo let us travel, in our mind's eye, to the pastel dreamland of the French Riviera. Let us imagine ourselves at Monte Carlo in May for the most colorful and exciting of all Grand Prix . . .

Since the first race was run through the ribboning streets some thirty-two years ago the legendary idols of speed have all won splendid victories here: Nuvolari, Varzi, Caracciola, Farina, Fangio and, most recently, Moss of England. Because of its magnificent setting, this event at Monte Carlo — traditionally the season's Grand Prix opener — is unique in motor sport.

Eighteen times, from 1929 through 1960, titanic automotive battles have been waged in this tiny principality (half the size of New York's Central Park) set like a blazing jewel on a high, white limestone cliff mid-way between Nice and the Italian-French border along the rocky, scenic *Cote d'Azur* (Azure Coast).

We learn something of the fascinating history of Monaco as we await the days of speed. It is a history of blood and conquest, extending back to Henry VI, a Roman emperor who first gave Monaco to the Genoese in 1191. By 1856 the site was firmly in the domain of Prince Charles III of France, who established gaming tables for which the principality is now world famous. In 1863 François Blanc built a casino in Monte Carlo — and the incredible legends of doomed souls began to flourish.

As the rosewood roulette wheels spun away all their earthly goods, hauntingly beautiful women swallowed poison in the casino gardens, while proud, handsome men boldly leaped from the towering rocks into the blue-green depths of the Mediterranean. Counts and Grand Dukes wagered castle and mistress on the maddening caprice of the tiny, dancing ivory ball — and a host of professional gamblers came to the casino to match their "infallible" systems against the wheels.

Then, in 1929, another kind of gambler came to the lush French Riviera: the continental motor aces who coolly wagered life against death. They brought their own wheels, attached to bellowing, panther-quick racing machines. The mysterious Englishman, William Grover (who competed as "Williams") won that initial race through the streets of Monte Carlo in an immortal greyhound-lean Bugatti.

A new kind of fame had come to Monaco.

Now the wheeled panthers are about to unleash their power; now the first practice session is about to begin . . .

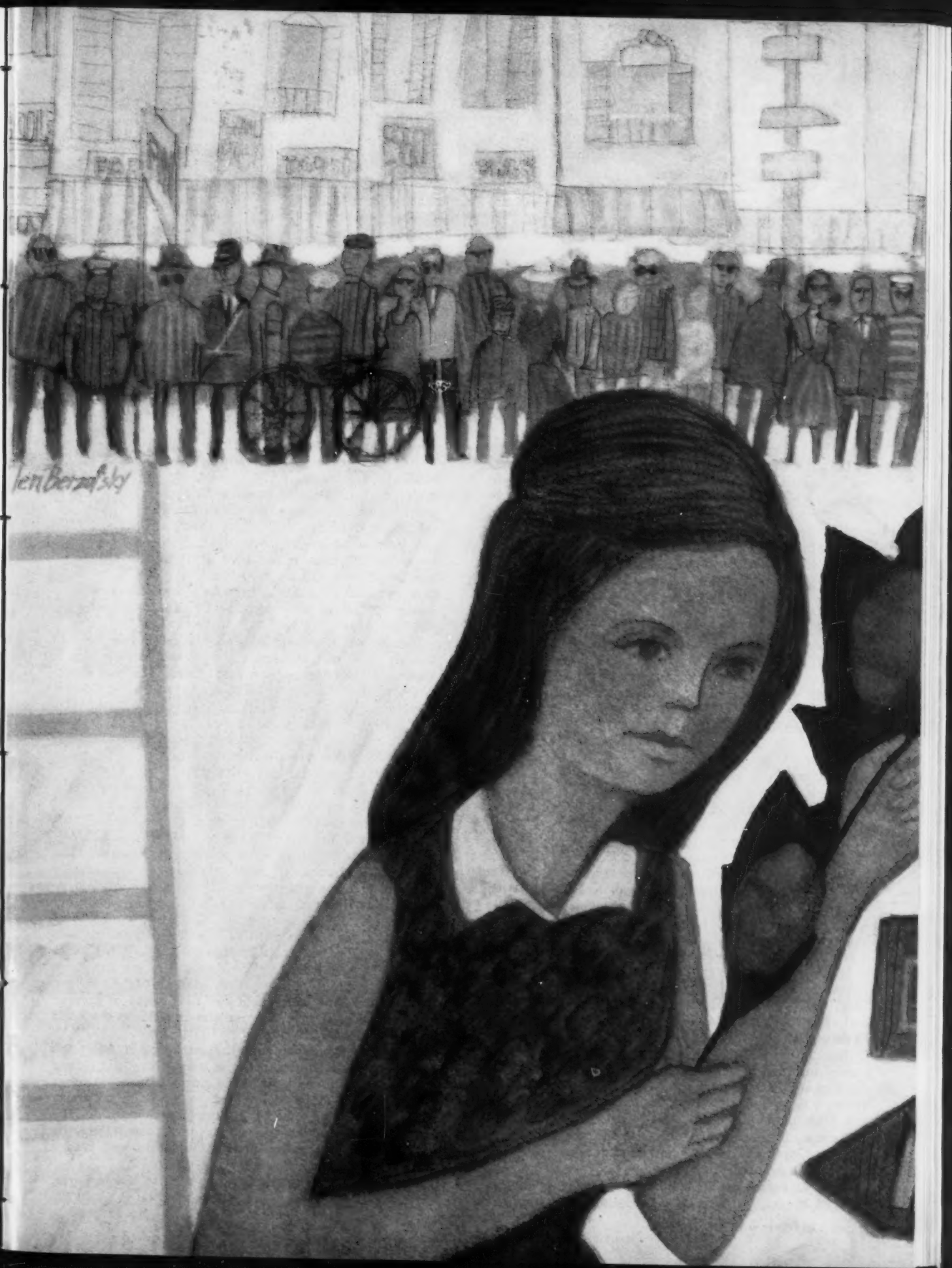
Due to the severity of the circuit, only 16 cars are allowed to make up the starting field. Since perhaps 25 drivers are on hand, the fiercely-competitive practice session continues into the dusk as glowing neons illumine the fashionable shops behind the pit area. Early diners at the Rampoldi drink *Bouquet de Provence* as they watch the cars cannon past — and an old prune-wrinkled man orders another can of Albert-Brän on the quay, oblivious to the din beyond the bar.

The circuit itself is extremely tricky, snaking through Monte Carlo's streets and boulevards for a length just under two miles. It begins with a short run along the quay, fronting the harbor. An abrupt right-hand turn at the Gasworks takes the field back behind the pits on the straight along Boulevard Albert I to Sainte Devote corner, then up the steeply climbing Avenue de Monte Carlo through a brief series of Esses to Casino Corner, downhill to the pretzel-shaped Station Hairpin, with the descent ending at the turn into Boulevard Louis II, then a dip into the raven's-wing blackness of the tunnel (where only the bravest maintain full-throttle) to a fast chicane leading out along the quay again to the final, sharp left-hander onto the pit straight. This, then,

(Continued overleaf)

ILLUSTRATION: LEN BERZOFSKY

ILLUSTRATION: LEN BERZOFSKY



is the fabled "'round the houses" circuit — the last of the classic city street races, providing a test for man and machine unlike any other in Europe.

A final practice session is held on Saturday afternoon, and that night, as a moon the color of Cinzano climbs the darkening sky above Monte Carlo, team mechanics patiently make final adjustments, perfecting engines for Sunday's brutal 100-lap contest.

The heavy clamoring bells of the Church of St. Charles announce the day. By noon the streets are closed to normal traffic. Stairways and alleys are blocked by barricades; stout fencing holds back the incautious. Resembling a city under seige, Monte Carlo girds itself for motorized battle.

The competing cars roll smoothly into position on the bannered quay front, forming seven rows. The sky is overcast and sunless; a grossly-distended cloud over the *Alpes Maritimes* presages rain. The waters of the Mediterranean lap quietly against the gray, monolithic stones outside the harbor entrance. Date palms stir faintly, and the scarlet Riviera flowers burn against the cool green of the casino gardens. Multi-colored villas and apartments dot the cliffs, rising in steps like an immense layer cake above the streets.

Now the crowd gathers, jamming the grandstands along the pit straight and Casino Corner, filing slowly out onto the flowered lawns and countless iron-lace balconies overlooking the course: pert French girls in full swirling dresses, their dark hair piled high to frame cream-white faces; regal, blonde-bearded Danes; Italian girls in bright sweaters and Capri pants; sad-eyed Belgians; red-faced, mustachioed Englishmen; crewcut Americans in Bermuda shorts — and the native Monégasques, tall with pride for their small city on this Sunday of Sundays.

The circuit is silent and waiting, ringed by lion-colored straw bales over which are stretched cloth ESSO and ENERGOL signs. A band on the quay sends its brassy music into the smoke-hued sky, as Rainier III makes a rapid tour of the course at the wheel of a black Peugeot sedan. His coolly-beautiful wife is beside him, the former Grace Kelly of Hollywood, dressed entirely in white. She waves a gloved hand as the Prince briskly slides Casino Corner.

Track workmen are whitewashing the curbs for greater definition; an artist sets up his easel, ready to paint speed; swan-white yachts dip and weave in the harbor, stitching indigo patterns in the quiet waters. High on its jutting limestone perch, the palace of Monaco — flanked by bronze cannon — seems to bestow its royal blessing. A helicopter hovers overhead like a nervous dragonfly — as a solemn-faced jeepload of black-hatted Gendarmes circulates to see that the course is clear, the jeep's flag making small handclaps in the wind of its passage.

Inside the eternal Victorian gloom of the Casino the impersonal roulette wheels still turn. The players are not concerned with the mechanized battle of steel and flesh about to be fought outside; they are only concerned in their own intense struggle with the God of Fortune.

Now the music dies, the crowd-voice fades to a murmur — and the drivers slide into their snug cockpits, tugging at helmet straps and goggles, their minds filled with turn and straightaway, with engine revolutions and braking points.

Sixteen engines explode into life . . . the flag drops, and the *Grand Prix de Monaco* is underway: a tide of thundering metal set in motion.

Loudspeakers blare out positions — in emotionally-charged French and clipped, calm English — as the cars boom up Avenue de Monte Carlo, the metallic howl of their straining engines echoing between the terraced buildings. Now they slide wildly round the Casino and plunge downhill toward the Station Hairpin.

This is a time of thrusting nose-to-nose duels, a time to weigh courage and skill, and each driver extends his nerve and muscle to the maximum as lead positions are savagely contested. Here the man and his machine function as a single, bright entity, not wholly flesh nor wholly steel, yet each dependent on the other. A mating of bone and chassis.

At 25 laps, or quarter-distance, the sullen sky releases its first spatter of rain. The drops sift down over Monte Carlo, staining the white deck chairs and coating the turns. The waters of the Mediterranean, home of conger-eel and the giant tortoise, turn to brooding purple as umbrellas are unfurled like a host of dark flowers along the high balconies.

Drivers grimly fight to maintain traction on roads gone slick as lake ice; a Ferrari spins lazily, then throttles back into the fray.

At the half-way point the sun is ironically shining between cloud patches, but the rain continues. The streets are treacherous with their wet coating of oil and rubber; brakes begin to fade; transmissions fail; engines cease — as the Prix extracts its toll.

The race roars on.

Café au lait is sipped at sidewalk tables under candy-striped awnings; champagne glasses tinkle faintly on the terrace of the Hotel de Paris as toasts are lifted to gallant drivers no longer in the fight. The early duels are over and the pattern has been set. The final triumph is at hand.

A locomotive rumble of thunder marks the downward sweep of the checkered flag — and the great contest is officially over.

Helmet off, a wreath around his neck, one hand in the air at salute, the smiling winner takes his lap of victory to the cheers of the vast crowd. The rain sheets down, a silver torrent, as he winds out of Casino Corner. A young girl, flushed and excited, rushes forward to toss three red roses at the passing champion. The flowers fall to the rain-black roadway, scattering their soft petals along the asphalt . . .

But the ritual is not yet complete.

That evening, a festive, post-race Gala begins in the lush Empire Room of the Hotel de Paris, and it is here, under the crystal fire of the teardrop chandeliers, that the last act of the *Grand Prix de Monaco* is staged.

To a sudden silence, a single stabbing drumbeat announces the entrance of the royal couple. Princess Grace steps through the wide doorway between the tall marble statues in a gown of shimmering white, followed by her Prince and their entourage. A slow-rolling drumbeat follows them to a special table — and as they are seated waiting violins sweep gayly into *The Blue Danube*.

The Gala is as wild as the race itself; there are dancing girls weaving sensuously between red-velvet pillars, and balloons and horns and top hats made of colored paper. Princess Grace does the cha-cha-cha as the band beats out frantic rhythms.

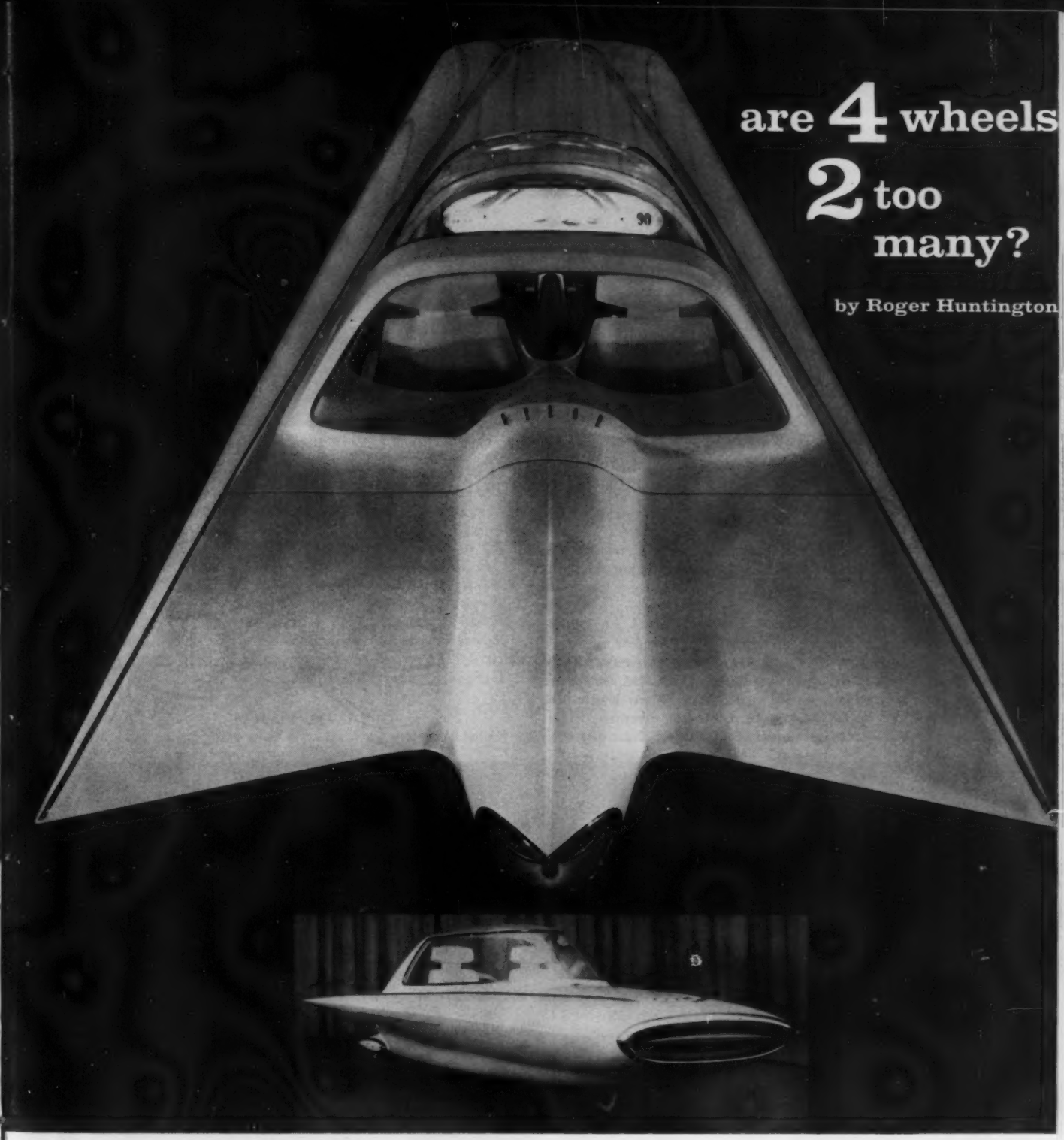
The night wears on and the last curtain falls; the violins turn sad; the dancing is done. Now the Grand Prix circus will move on, away from Monaco to other great battles — on to Zandvoort, to Silverstone, Monza and Buenos Aires, on to the other great circuits of the continent. But when it is spring once more along the blue Mediterranean the men and the cars will return to the *Cote d'Azur*.

The Gods of the Road will come back to Monte Carlo.

—WFN

are 4 wheels 2 too many?

by Roger Huntington



Ford's new Gyron joins Pininfarina's "X" in probing the extremes of automotive geometry and shape.

► Throughout the history of the automobile – or perhaps we should get basic now and call it a "personal road vehicle" – the generally-accepted configuration placed a wheel at each corner of an essentially rectangular planform. This layout was thought to give the best compromise between stability, payload space, and general mobility over various types of roadways.

But now let's do some "visioneering". Picture a car with *two* wheels in tandem, seats disposed within the wheelbase on both sides of the center line, and a body with a general delta shape – more or less pointed at the front, tapering out to a fairly broad tail behind the rear wheel. Such a car would have several obvious advantages over the four-wheel configuration: The aerodynamics would be beautiful. You'd have less frontal area for a given amount of passenger space. The CW factor, or drag coefficient, would be relatively low because of the pointed nose and taper shape. And – very important – it would be aerodynamically *stable,* because the effective center of air pressure would be behind the center of gravity (instead of up around the nose of the car as at

Idea of gyro-stabilized two-wheeler goes back to James Scripps Booth's 1913 Bi-Autogo. Detroit Historical Museum, current owner, supplied the photo.

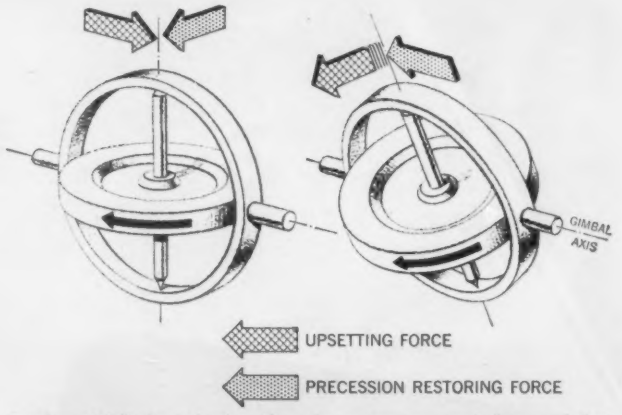
present). This could be vital on future super-speed highways. Furthermore the cornering situation could be improved by *banking* the car into the turns. Not only would you get more cornering power per pound of load from the tires, but the centrifugal side load on the passengers would be converted to a *down*-load by the banking angle. The two-wheel car would open up entire new horizons in vehicle design and development.

But, of course, there's the problem of stabilization. You'd have to steer-balance the car like a motorcycle, and drop down auxiliary wheels to balance the car when it stopped. This wouldn't be at all practical for the average driver. But does it *have* to be stabilized this way? How about a *gyroscope* to balance the car? This would not only hold it rock-steady when in motion, but it would be just as stable standing still at a curb or waiting for a traffic light. And it can be adapted to stabilizing in a banked turn. We've learned a lot about gyroscopes through aircraft and missile engineering in the last 20 years — and right now this looks like a very practical way to stabilize a usable two-wheel car.

All this is a thumbnail sketch of Ford's radical new dream car, "Gyron", that was just introduced at the International Automobile Show in New York. The show car is just a mock-up, but the concept of two wheels and gyro stabilization appears to be a firm idea at Ford Styling. The "visioneers" are just waiting for the day when the budget is big enough to permit a full-size working model. CAR AND DRIVER thinks this is an important enough development to warrant detailed analysis at this time, especially in view of the work being done elsewhere on variations from the conventional layout like Pininfarina's "X" vehicle (SCI, March, 1961).

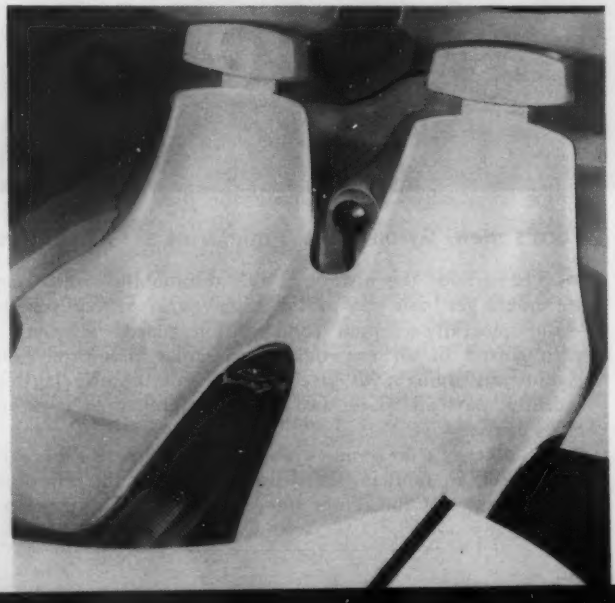
SOME GYRO-DYNAMICS

Before we go any farther in this discussion I think it is essential to know something of the principle and operation of a gyroscope. The basic principle is quite simple: *any rotating mass will resist an effort to tilt its axis of rotation.* You can move the mass *parallel* to its axis of rotation, or at right angles on the axis, or in any other direction — as long as the axis isn't *tilted* — and the only resistance will be the usual inertia when you accelerate any body. But when you try to tilt the axis of rotation a powerful counter force is generated. And here's the second vital point: This counter-torque, which resists the original torque or force trying to tilt the axis of rotation, appears *at right angles* to the axis of rotation. (The actual direction of this counter-torque at right angles depends on the direction of rotation of the



Drawing at left shows basic action of a gyroscope mounted on a gimbal. Upsetting force, originating in the vehicle in this case, generates the precession restoring force indicated. This generated force then itself becomes an upsetting force, tilting the gyroscope about its gimbal axis as shown in the right-hand drawing. Yet another precession restoring force is thus generated which opposes the original upsetting force and keeps the vehicle upright. At high gyro rpm the motions are invisible.

Passenger canopy swings up to provide access to twin coal-scuttle seats. About five minutes would be needed for gyro to climb to running speed.



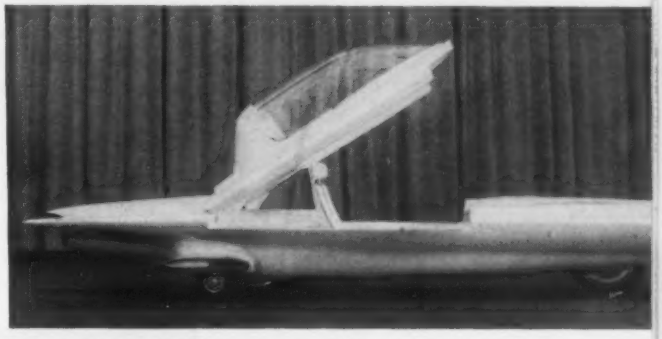
mass, and needn't concern us here; it's not significant in this problem.) This counter force is called "precession" torque. The accompanying drawing shows the directions of these forces.

A little thought will show that a rotating mass with its axis locked in one plane couldn't stabilize anything. It would resist any effort to tilt the axis, but, once tilted, there would be no *restoring moment*, or force, generated tending to *return* the axis to the original position. The word "stability" implies the existence of this automatic restoring moment — so forces tending to throw the car out of line will inherently generate forces to push it back again. We can get this effect very simply with a gyro by mounting it in a "gimbal" frame so it is free to tilt on an axis at right angles to the major gyro axis — *and* at right angles to the axis about which you want to stabilize.

This effect is perfectly illustrated by a small 15-inch-long scale model of the Gyron, rigged up by Ford stylist Alex Tremulis to demonstrate the feasibility of gyro stabilization. This uses a two-inch, two-pound gyro from an aircraft turn-and-bank indicator, operating at speeds up to 18,000 rpm by a shot of compressed air. The major gyro axis lies vertically on the center line of the car. The gimbal axis lies horizontally *across* the car. Okay. When any force operates to *roll* the car one way or the other (about a fore-and-aft axis) the precession torque will cause the gyro to tilt forward or back about the lateral gimbal axis. This, in turn, causes a counter precession torque *about the roll axis* — which causes the car to straighten right back up again! It's an inherently stable situation.

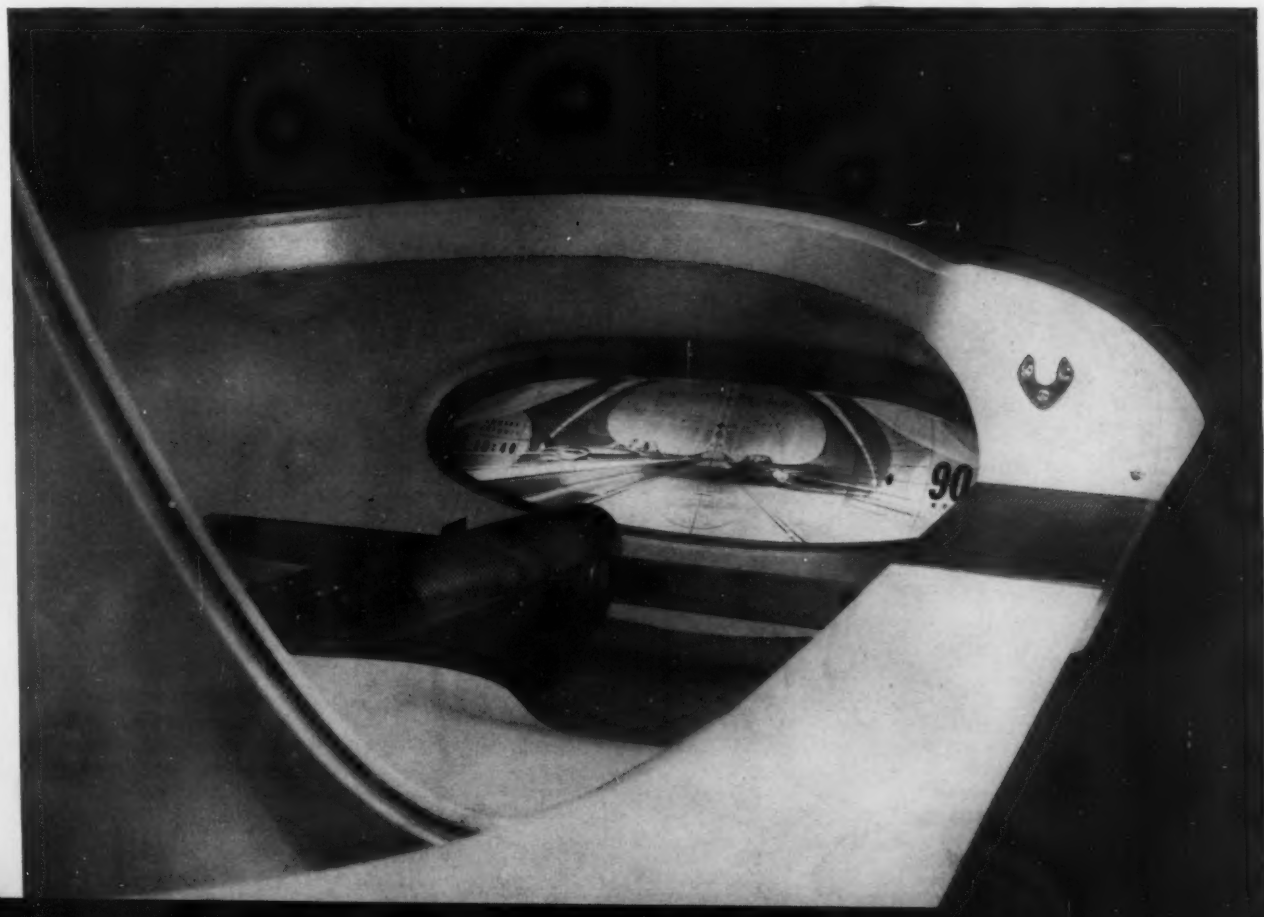
That little model is the craziest thing you ever saw. When you get the gyro winding up around 20,000 rpm it will sit right there on its two wheels, steady as a rock. You can whack it sharply on one side and it will hardly budge. You can drop the model squarely on its wheels from a height of a foot—and it'll bounce and stand right there. You can tip and shift the table sideways under the model; it will skid sideways a little, but won't tip over. You can push it across the floor and crash it into a board with a glancing blow. It will stand right there. Crazy.

All this time, with the gyro turning at high speed, the oscillations of the gyro about the roll and gimbal axes are practically imperceptible. You can sight along the edge of the gyro or the car and not detect any movement. But then, as the gyro gradually slows down, coasting to a stop, these stabilizing oscillations grow more pronounced. The car slowly rolls from one side to the other, while the gyro inside rolls about the gimbal axis (*Continued on page 110*)



Engineers believe 20,000 rpm gyro would coast for 2½ to 3 days after shutoff, with enough speed to stabilize Gyron without twin side wheels.

In cockpit mockup, driver would press speed and destination buttons for highway of tomorrow. Infra-red "snooperscope" would give all-weather vision.



ENZO'S SPEED SIXES

Chief engineer Chiti broke with all the Ferrari traditions except the one that demands the most exciting race cars on the road when he designed Maranello's dynamic sports and Grand Prix cars for '61.

► Why 120 degrees, Mr. Chiti? "Because 120 degrees is theoretically the ideal layout for a V6 engine with regard to vibration and is easier to balance than a 60-degree unit. Our new Formula 1 engine is 55 pounds lighter than last year's and we've been able to extract more horsepower as well."

These were the words of Ferrari chief engineer Chiti, whose new Formula 1 engine was shown for the first time to the press in February. The 1960 1.5-liter Dino V6 was giving an honest 167-168 DIN bhp; the new 120-degree power unit is expected to develop an easy 180 right off the bat. Catalogued by Ferrari at 190 @ 9500, this engine will be a sensation provided all development goes well.

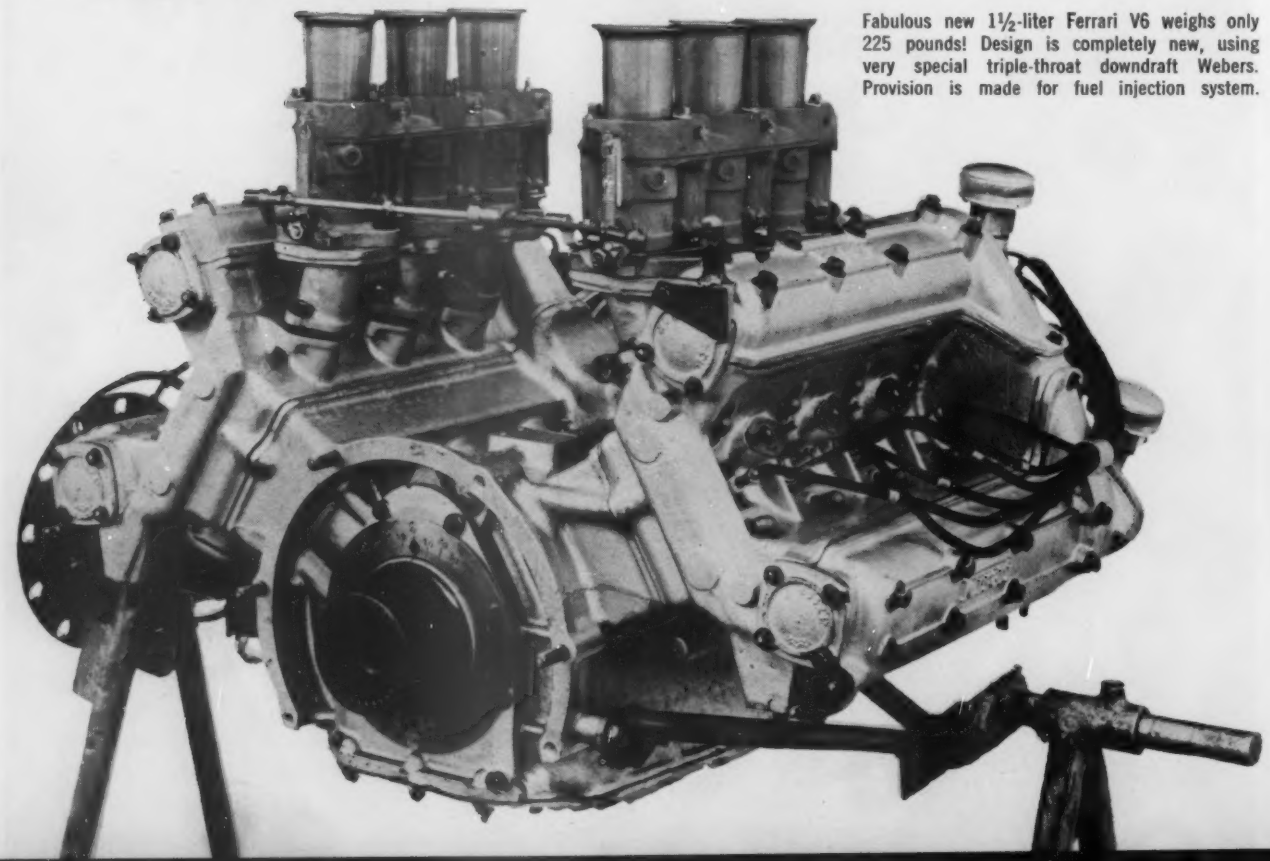
Bore and stroke remain the same and the valve gear is likewise the same as last year, Chiti feeling that desmodromic operation is only of value if the engine is revving continuously over 10,000 rpm. Maximum horsepower is obtained at 9500 rpm on the 120-degree design, an on-paper addition of only 500 revs, but in actual fact Ferrari drivers will find a good extra thousand in hand.

The saving of over 50 pounds with this new engine would put the car under the minimum weight limit but Chiti said that he has now been able to reinforce the chassis slightly here and there as well as make the body a bit stronger to bring the weight over the 450 kilogram (990 pound) minimum.

The other sensation at the Ferrari press conference was his rear-engined sports car for 1961. It will be using the 65-degree V6 of 2.4 liters, and mechanically speaking the car is virtually the Formula 1 machine made into an aerodynamic two-seater. Ferrari himself admitted this, at the same time expressing regret that the sports car has degenerated to this point. He too feels that the future of sports car racing will be found in G.T. cars but has developed this new car for the Targa Florio and Le Mans. Considering Le Mans the most important race in the world, Ferrari confirmed his participation in it as well as all other Championship sports car races of the year.

Chiti told us that he has developed his own small wind tunnel in a corner of the Ferrari factory and that considerable time was spent with models of the new sports car in the tunnel. All Ferraris will be tunnel-tested in the future, something new for Maranello, which must make the Italian firm the most complete and self-contained race car factory in the world. The sports car wheelbase is 91.2 inches while the Formula 1 chassis is being held at 90.5 inches. Both cars are of equal length but the higher bodywork of the sports machine raises the height almost two inches above the Formula car's roll bar. Both look small and compact, however rugged and powerful as well. The lines of the sports car resemble none Ferrari has ever had before.

The Ferrari team will consist of Phil Hill, Richie Ginther and Wolfgang von Trips for Formula 1 while the sports cars will also be seen with such people as Gendebien and Mairesse behind the wheel. In addition, Enzo Ferrari has offered one Formula 1 car to an Italian driver.



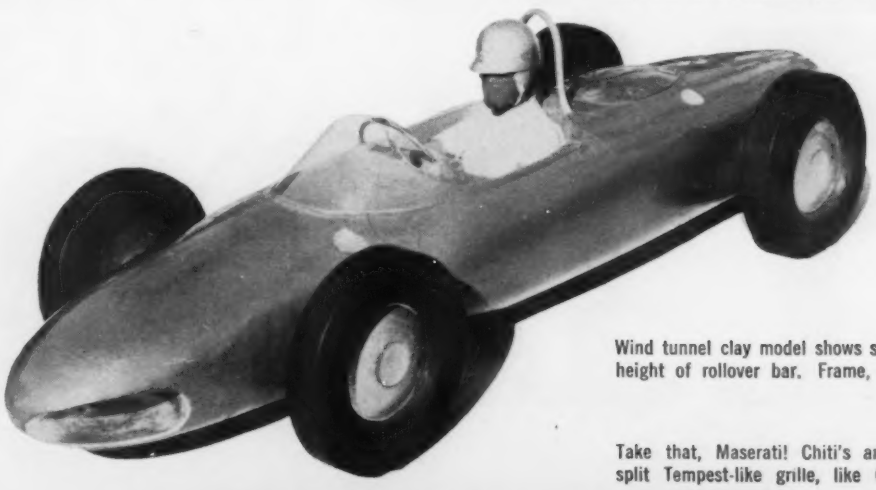
Fabulous new 1½-liter Ferrari V6 weighs only 225 pounds! Design is completely new, using very special triple-throat downdraft Webers. Provision is made for fuel injection system.

Ferrari will most definitely be competing in the Intercontinental Formula as well in 1961, at least as far as Championship sports and Formula 1 commitments will allow. The chances of a Ferrari being seen at Indianapolis are slim indeed but he did admit that he had written to the organizers for a set of regulations. The Intercontinental weapon will be the rear-engined chassis but with the 65-degree V6 Dino engine enlarged to 2925 cc. Ferrari rates this engine (87 x 82 mm) at 310 bhp at 7500 rpm.

(Apparently Enzo Ferrari was not aware of the fact that Coventry Climax will not be supporting the Intercontinental Formula. An official statement from Wally Hassan, chief engineer at Climax, said that they will not bore out any 2.5-liter Formula engines for the simple reason that they will not stand the gaff and Climax will not be responsible for any engines so raced. Under protest, more or less, they will be making one engine for Jack Brabham's Indianapolis effort but after that — *basta*!)

All the people at Ferrari agree that the 1961 season is going to keep them more than just a bit busy. As usual Enzo Ferrari is ready to participate in all Formulas that seem to him worthwile. As he said at his press conference, "every formula has its advantages and disadvantages." His ambitious effort for 1961 is being made in an atmosphere of confidence that will honor his country in the thousandth anniversary of the Italian Republic. —*Jesse Alexander*

High tail of new 246-Sport hides reworked 1960 G.P. engine (see page 87) and G.P. gearbox. Two of these were expected to run at Sebring.



Wind tunnel clay model shows sleek lines of new low Formula 1 car, also height of rollover bar. Frame, suspension are much like 1960 F.2 car.

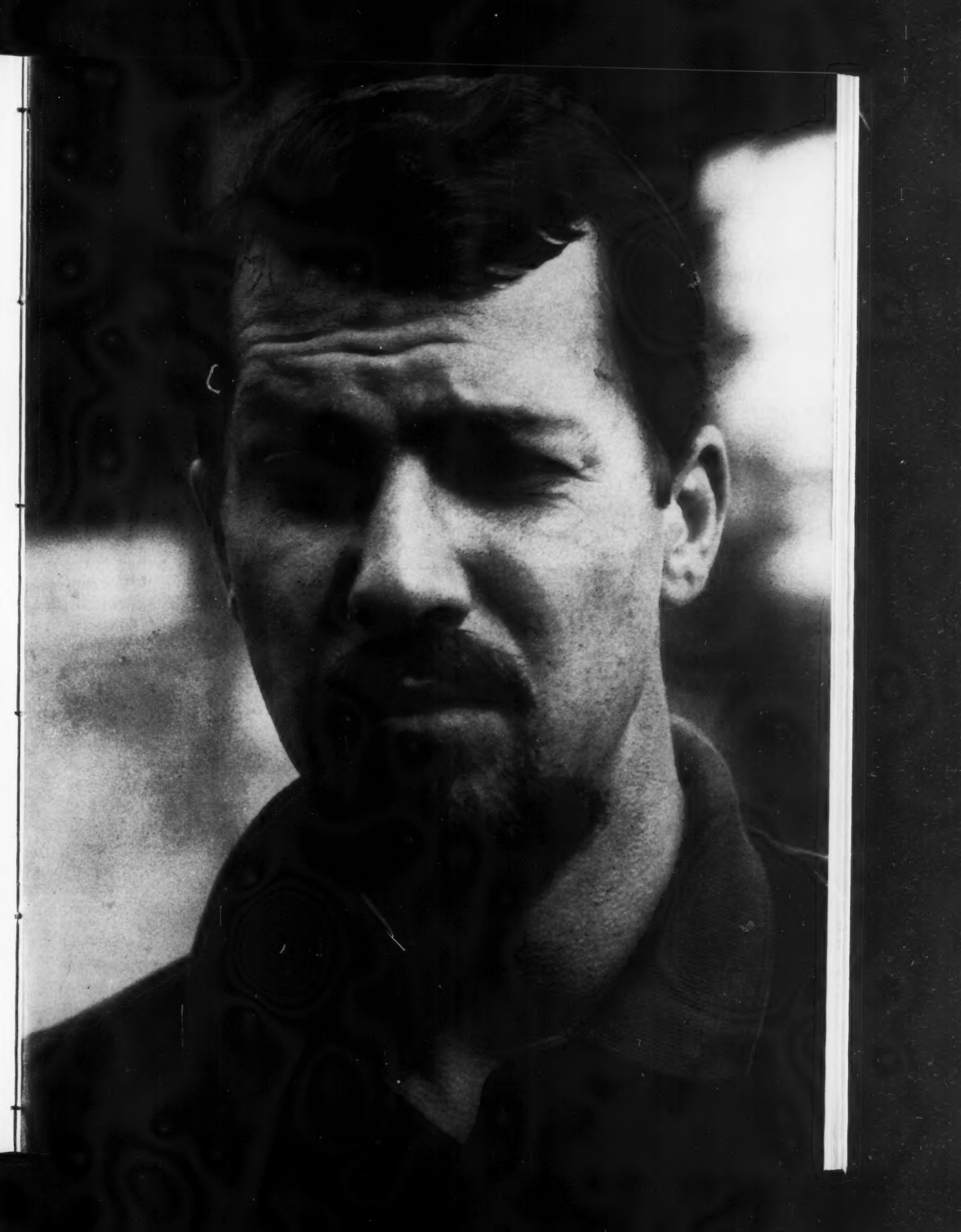
Take that, Maserati! Chiti's answer to Alfieri's Type 63 Birdcage has split Tempest-like grille, like G.P. car, marking break with the past.

On the following two pages Steve McNamara limns the competitive life of the remarkable bearded Swede whose racing driver friends insist that you . . .

Call Him Joe

PHOTOGRAPHY: WETMANN

Wife-to-be Marianne (left) was delighted as spectators and B.R.M. mechanics (right) at Joe Bonnier's first G.P. victory.



► When Joakim Bonnier burst on the American motor-racing world in the mid-1950s he was known as Yo-Yo. A tall, bearded, suave Swede, Yo-Yo and Ulf Norinder, another tall, bearded, suave Swede, roared through the social sidelights of Nassau and Sebring like latter-day Vikings. Female members of the motoring set found them almost irresistible; males knew their adventures were always good for at least a laugh, and usually something more warming. Although their conquering air was occasionally interpreted as arrogance, they were in the main well-liked by the intensely competitive men who make up the front rank of world motor racing. For these men knew that Yo-Yo and Ulfie weren't threats in a racing car. In helmets or out, they looked more like racing drivers than a casting director's fondest dream, but they weren't very good.

The late Jean Behra displays a bit of ham-handed humor as he tries to do in Bonnier.

Today Joakim Bonnier, 31, is known as Joe. He carries his well-tailored frame (6-2, 170) with the confident air of a man who has seen a great deal of the world and is satisfied with his place and prospects in it. He speaks frankly with reasoned opinions on a great variety of subjects. He has no violent likes or dislikes ("I try to be smooth.") and his mannner is unlike the aura of high tension which envelops many drivers. He has won the Grand Prix of the Netherlands (Formula 1), the Grand Prix of Germany (Formula 2) and the only remaining open road championship sports car race, the Targa Florio. Tony Brooks considers Bonnier a ". . . big surprise; one of the most improved drivers in the last four or five years." Dan Gurney, in typically succinct fashion, says merely, "He's capable of winning every time he goes out." Last season Bonnier drove Formula 1 for B.R.M., a firm of generous salaries and noble ideals but woefully unreliable automobiles. This season he drives for Porsche, and Porsche is loaded for bear. The time has passed when competing drivers could consider Bonnier a serious competitor only for off-track triumphs.

DOLIN

An unsmiling Bonnier listens to Nassau cocktail party-goer Johnny Cuevas.

That past isn't too distant, and reminders are occasionally present. A friend dropped by Bonnier's hotel room at Riverside last fall and spotted an enormous rubber python coiled on a dresser. It would have been commonplace three years ago; it was somewhat surprising at the second Grand Prize of the United States. Bonnier admitted, with as close to a sheepish grin as he can muster, that the snake belonged to Ulf, who was sharing the room. The dresser ornament that belonged to Bonnier was a large picture of Marianne, his beautiful bride of a year, a kindergarten teacher who wasn't with him because they had sensibly decided that she should finish the last year of a four-year preparatory course.

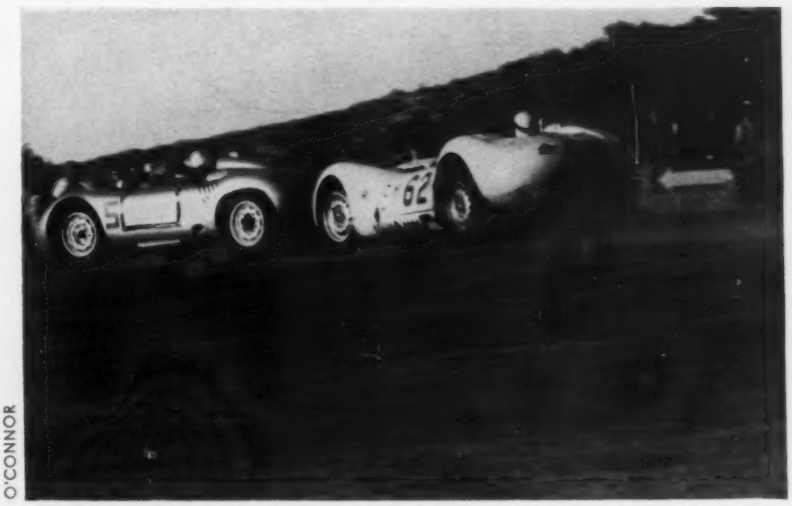
Some of Bonnier's early races were epics in the history of car destruction, but emphatically and paradoxically, he has never had a reputation as a hard man on machinery. The early misadventures can be laid to exuberance and inexperience. His driving style calmed down much more quickly than did his social life, an important distinction quite often, and quite understandably, overlooked. In discussing the "transformation" of Bonnier, Brooks remarked that it's wrong to say he is smoother now—"He never was rough," Tony said. "He's aggressive all right, but it's not my impression that he's been hard on cars." Strangely, words of caution that Bonnier tries to follow very

carefully came from Jean Behra, a valiant and skillful driver who increasingly ignored his own advice, with fatal results.

Few drivers are really good mechanics but virtually all strike the pose. Not Bonnier. "Mechanics doesn't interest me and I don't know much about it. Lots of drivers fiddle around with their cars but I think they do more harm than good." After the Grand Prix of Morocco in 1958 the B.R.M. mechanics asked him puckishly if he'd noticed anything different during the latter stages of the race. Bonnier said certainly not. He was told the anti-roll bar had broken. Bonnier made what he hoped was the suitable grimace and walked away wondering what in the world they were talking about. Last season Graham Hill, one of the few mechanically-knowledgable drivers, taught Bonnier some of the rudimentary theory and jargon, but he says frankly that he'd be hopeless as a test driver.

Bonnier reversed the usual driver-dealer progression common in Grand Prix circles. Before he had turned a serious lap he was the Alfa Romeo distributor for all of Sweden and once he decided on racing as a career he dropped the business permanently. It's just as well; he looks much more the part of a naval officer or a modern art dealer, both of which he is. Most Swedes pride themselves on a cosmopolitan outlook, some with good reason. Bonnier has good reason. He lives in Switzerland, seems equally at home in any part of the world and speaks, besides the Scandanavian languages, English, French, German, Italian and Spanish. He says his Spanish isn't up to snuff because he persists in confusing it with Italian, but in all these tongues he's several laps ahead of most men on the Grand Prix tour.

One "unusual" aspect of Bonnier's career, his methodical development into a front-rank driver, is more truly a commentary on the unusual state of motor racing during the last few years. Stirling Moss was considered something of a miracle when he did well in his first races of any consequence, but recently Bruce McLaren, Dan Gurney, John Surtees, Jimmy Clark, Chris Bristow, Alan Stacey, Michael Taylor and several others have stormed into their maiden seasons with spectacular results. Even the deaths of Bristow and Stacey seemed to some to confirm the belief that it was a young man's game and during the first season you proved that you either had it or you didn't. What they truly confirmed, and what Bonnier has confirmed, is that skill and verve must be accompanied by experience. When they are not the results are seldom consistent and often very dangerous.



O'CONNOR

During his 1960 American tour Bonnier was adversely impressed by U. S. drivers. Their aggressive tactics (above) were not appreciated by visitors.

Bonnier's acquaintance with motor racing came quite late considering the toddler stage at which most American and British drivers turned their first wheel. This is understandable; he was the son of a professor of genetics, now retired, in a nation that has never warmed to violent sport of any sort. Professor Bonnier wasn't interested in automobiles other than for transportation, nor were there seeds of interest among other branches of the family, which includes owners of Bonniers, Inc., a large publishing house. This decidedly non-automotive background still causes Bonnier to puzzle over an event that occurred when he was five years old. "Somebody asked me what I wanted to be when I grew up and I answered right back, 'a race driver.' At five (*Continued on page 114*)

Road Research Report: PEUGEOT 404

► We've often wondered why the Swiss don't build a car. They're prosperous folk, who can afford to make and buy them. The jagged landscape of Switzerland would produce a rugged car with versatile handling and performance, and the construction would be superb, by virtue of Swiss precision skill and a national sense of responsibility. The product might lack vivid character, but would surely provide capable, durable point-to-point transport.

During a recent trip to the Peugeot factory, and many miles over French Alpine roads in a new 404, it became clear that Peugeot is, for all practical purposes, the Swiss automobile! The factory at Sochaux, France is a scant nine miles from the Swiss border, and in fact we stayed 40 miles away at Basel, Switzerland, where the French, German and Swiss borders meet. The people in that part of France are primarily country folk with typical Swiss conscience and stability; it was estimated that between two and three hundred Peugeot employees have been with the company 40 years or more! Many of them were once involved in the watch-making industry that used to flourish in eastern France.

The ingredients seem right; the proof of the pudding is that the relatively expensive Peugeot is outsold in the entirely open Swiss market only by Volkswagen, Renault, Opel and Fiat! Moreover the 404 proved to be capable and durable, as expected, these Swiss virtues being balanced by a dash of French flair and chic.

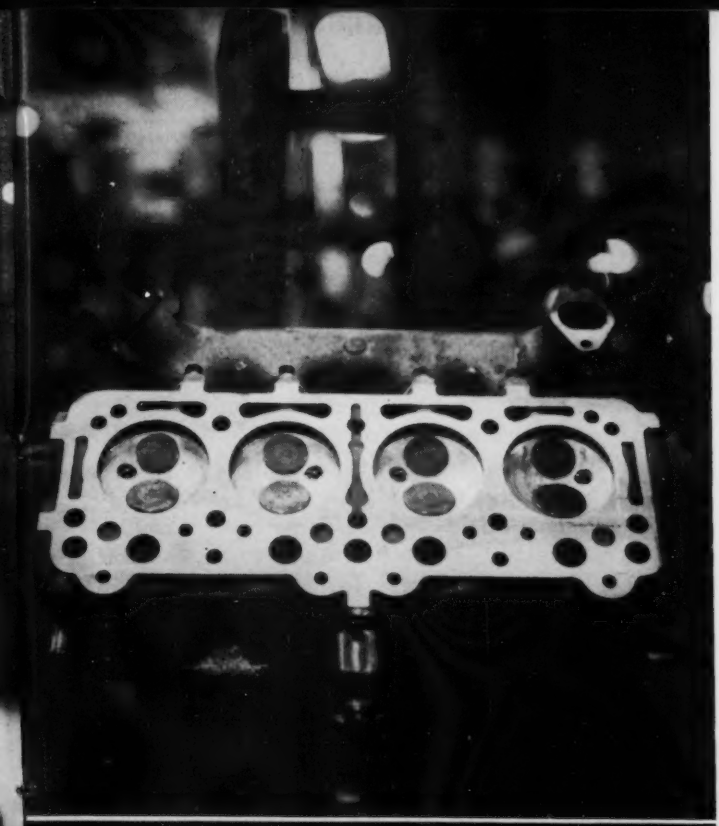
COMPANY POLICY

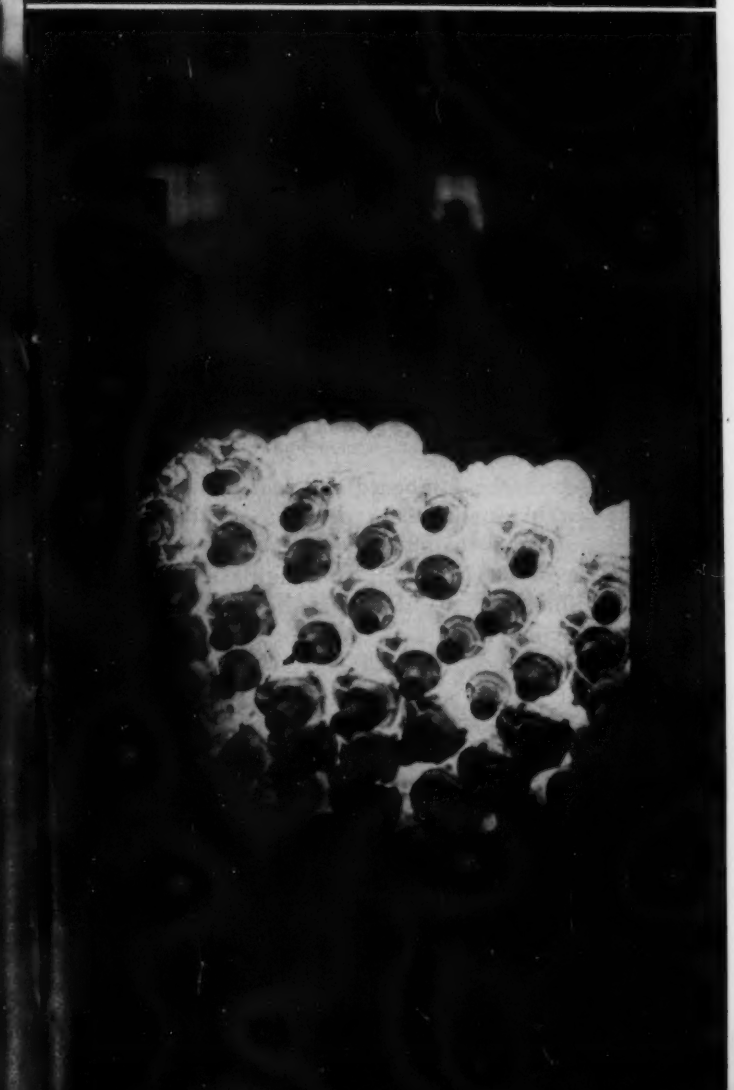
You've probably already gathered this is an unusual Road Research Report, specially expanded for CAR AND DRIVER's Auto Show Issue, describing a model that makes its official U.S. debut at the International Auto Show in New York. C/D drove half a dozen different 404s over 600 miles of the no-holds-barred highways of France, and was able to confirm its impressions of the car by a complete tour of the factory and conferences with Peugeot engineers and management. Seldom have we felt we so thoroughly understood a car.

Peugeot has been building cars since 1889, since 1928 in the factory at Sochaux, where development and testing of new models is carried out in the labs and on the company's own highly demanding test track. The roads of Spain (dusty), Belgium (bumpy) and Switzerland (steep) are also used for prototype trials. New design and engineering take place in Paris, where management is headquartered.

The company's policy is directed toward a 15 percent increase of sales every year, and it's felt that a new model must be introduced at least every five years to maintain this growth. Work on the layout of the next step forward had already begun when the familiar Peugeot 403 model was unveiled at the Turin Motor Show on April 20, 1955. That car was styled by Pinin Farina (whose 403 prototype was built on a Fiat 1400 chassis), who remains a close friend of Peugeot.

1897 Peugeot





Quite clearly the 404 was designed around the interior dimensions of the 403 — the space available is practically identical — but with the goal of a smaller, slimmer exterior and lighter weight. The package size was set in Paris, then turned over to Pininfarina for surface treatment. We feel it did an excellent job with the lines of the 404, a handsome car it's a pleasure to live with.

BODY LOOKS AND FEATURES

From the front the 404 "comes on" strongly, with a low hood and broad grille reminiscent of a Lancia Flaminia or even a Ferrari. Oddly, though, the very small radiator uses only the right-hand half of the grille, indicating that a much smaller opening and better aerodynamics might have been obtained. Above bold parking and directional lights, the painted headlight rims are removable for attention to the sealed beams with only a tug of two fingers. Below the doors is a fluted rocker panel that readily unbolts from the integral (7300 spot welds) body; it was made this way originally to allow stainless steel to be used here, as it is on the rest of the 404's trim, but this idea was dropped. The front bumper is pierced for the crank that's stored under the hood, while the rear bumper is made in three parts to allow the ends to wrap all the way around to the wheel wells.

Though the 404 arrives well, it leaves less gracefully. The back end somehow looks "smaller than life" with its relatively simple lines and tail-up attitude. The tall tail-light assemblies appear to be housed in chromed sheet metal but are actually one-piece plastic parts with chromed surfaces, along lines used in this country. The key alone serves to open the counterbalanced trunk lid, there being two separate keys on European 404s but fortunately only one on U.S. cars. Within is a spacious and well-trimmed volume, flanked on the right by the vertically-placed spare, behind which are stored the jack and tools. With only three studs behind the bolt-on hubcaps, the wheels are easily changed, and special jacking sockets are provided at all four corners of the body.

WINDOWS AND DOORS

Integral construction didn't stand in the way of generous window area, and one of the complaints about the 403 has been eliminated by designing the rear-door windows to wind down completely. The small metal triangle at the rear of the window molding was needed to accomplish this. The roof pillars are small and well-placed. A sharp wrap-around at the corners of the windshield produces very slight distortion, not enough to trouble the driver.

The doors have push-button controls on the outside, freeing latches of the Wilmot-Breeden "Zero-Torque" type which work smoothly but not with the slickness of the same type of latches on the Fiat 2100. Inside are thumb-type door controls, integrated with door-closing

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At far left molten iron is ladled into brake drum molds at Sochaux's foundry. Above a 404 cylinder head awaits assembly, and below it are crankshafts in the raw, glowing fresh and hot from the forging hammer.

handles, which look awkward at first glance but turn out to be extremely easy to work with either hand. They're safe, too, in combination wih arm rests which are placed just right: always useful but never in the way.

Doors are locked by the pull-up knobs on the window cappings that have been so familiar here; they're backward, though, in that they pull up instead of push down to lock. The two rear doors can be locked by pulling up the knob and closing the door, but this isn't true of the front doors, which both carry key locks. An easy way to lock the 404 without using the key, then, is to close the front door, pull up its knob while standing at the open back door, then close the locked back door.

Peugeot doesn't build a two-door 404, and isn't likely to, so parents with small children will be reassured by the standard provision of a small lever, placed just under the door latch proper, which absolutely locks the inner door controls on the rear doors, no matter what the position of the lock knob. This is only typical of the thoughtful details to be found on Peugeot cars.

ADJUSTABLE INTERIOR

We found the simple yet handsome cloth-cum-vinyl interior of the 404 highly refreshing and very easy to live with. To our tastes this is one of the biggest advances over the 403, which had a rather "dated-looking" interior even in 1955. In Paris we saw several examples of a genuine leather interior that's being supplied to French buyers on special order. It's an absolute knockout, one of the nicest car interiors we've seen and completely in keeping with the rest of the car. There are no plans to offer this trim in the U.S., but if you'd be interested in leather in a 404, by all means write to the importers, whose address appears on the data panel. They'd like very much to know how you feel, and how much you'd pay for leather. In France, by the way – and perhaps even in export 404s – the right-hand door pocket contains some snips of the upholstery cloth to use for patching, just like a tailored suit!

The two separate front seats are excellent in shape and layout. The seats proper are deep in a fore-and-aft direction, providing comfortable thigh support, and have high, well-curved backs that support the shoulders and brace driver and passenger laterally, together with the semi-rough finish of the cloth upholstery. A fine adjustment of the seat back angle is standard equipment, allowing both selection of a good basic position and variation of that position for refreshment on a long trip. They'll go back *all* the way too, forming a very comfortable bed position for one or both sides.

ACCELERATOR PROBLEM

We felt fore-and-aft seat adjustment travel was too limited for a long-legged driver, the arrangement being such that adequate rear seat leg room is always available. Actually the driver's left leg can usually be stretched out comfortably, but the pendant-type accelerator pedal, placed right on a level with the brake and clutch, forces the right leg up off the seat in an attitude that induces ankle cramps after a long day at the wheel. One solution – very effective – is to press the accelerator to the floor at every opportunity; in France you can hold it there almost indefinitely with a 404. Better gas mileage will result from another solution: each seat is mounted on four stacks of blocks which can be interchanged to vary the overall seat height. We'd use these to raise the front of the seat only, which would accentuate the already-chair-height position of the knees relative to the pedals.

Headroom front and rear is adequate, but not for hat-on types. On the 403 the sliding roof is arranged so it seems to encroach on front-seat headroom; the 404's lid was widened so it definitely adds to the available altitude. This roof, of course, is a perfectly great item of standard equipment that does *not*, under any circumstances, leak. A full-width rear seat is a press fit for three good-sized males, made less bearable for the gent in the center by a not-unobtrusive drive shaft tunnel, but is just fine for two. In the latter case a central armrest, with an ashtray, can be swung down.

RICH NEW CONTROLS

The room, the seats and the adjustments are such that any driver will feel 100 percent comfortable in the 404; it's that rare kind of car. A contributing feature is the new more-horizontal angle of the big (16½-inch) steering wheel, which allows more thigh room without being so high that it blocks forward vision. It's a very convenient wheel to use – though we don't especially care for the full-circle horn ring. The wheel and column come in either cream or black, according to the paint scheme. Black looks much richer to us. Just under the wheel is a short plastic directional signal lever on the right, self-canceling with hairtrigger speed. On the left is a longer lever moving in an "L" pattern, which controls the headlights. In Europe this would also be used to dim the lights; Americans get a conventional floor button.

Like the wheel, the dashboard also comes in either a light color or black, the black being a crackle finish that looks extremely handsome and efficient and has the added virtue of completely eliminating reflections on the windshield. By all means get the crackle finish if you can. A vinyl-covered crash pad, reassuring to the knees, runs across the bottom of the dash.

We were at first prone to criticize the 404 for the way its minor controls are scattered seemingly at random over and under the dash, but on reflection we feel this may be preferable to lining them all up in a row where you forever confuse one for another. It takes a while to find all the 404's knobs and switches, but once you do you're in command.

REFINED VENTILATION

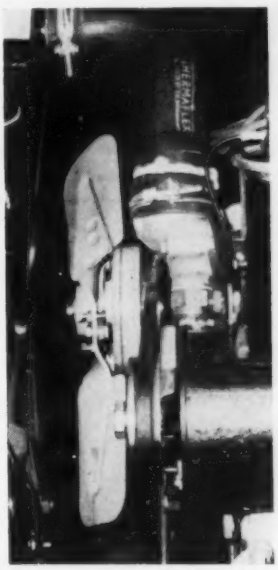
Smack in the center of the dash is a sturdy cast plate with two slots for the heater controls, which are cleverly integrated and a cinch to use once you know

(*text continued on page 128; data overleaf*)

Front of the 404 features broad grille, man-sized parking lights. Tail fins, seen in foreground, are useful as a guide when backing the sedan.

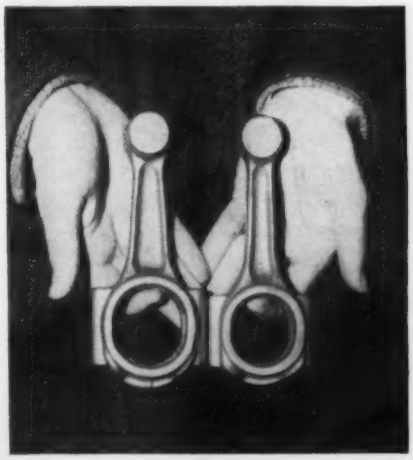
Headlight rim can be pulled off with two fingers for replacement or adjustment of sealed beam assemblies.

Thumb-type door control is easy to use, and neatly integrated with armrest and door pull.

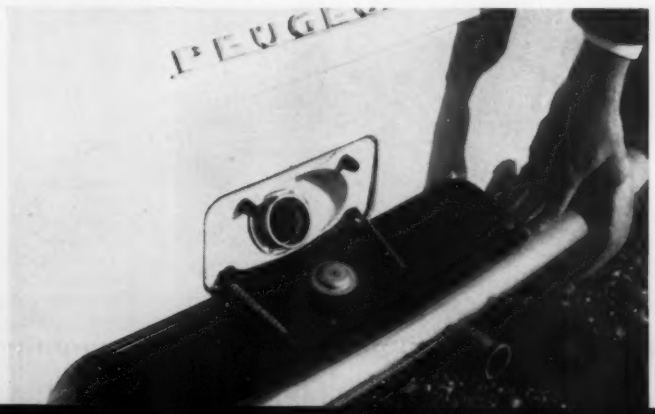


Thick hub of three-blade fan houses Peugeot's patented magnetic fan clutch. Cooling system isn't pressurized.

Forging blanks show how 404 connecting rod, on left, has bigger bearing and shank than 403.

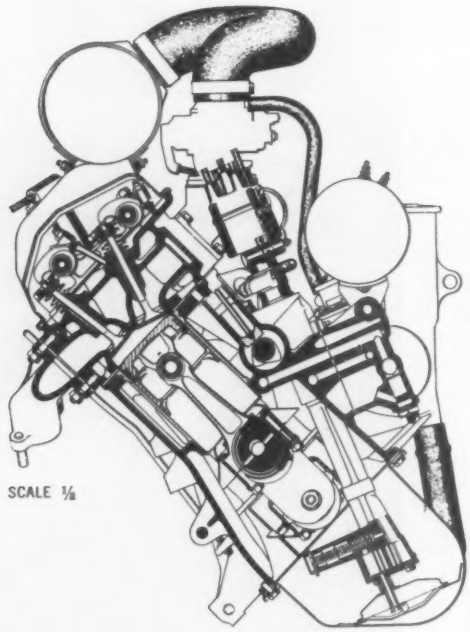


Fold-down license plate mounting conceals central fuel filler cap. Bumper, all other exterior bright metal of 404 is stainless steel for maximum life.



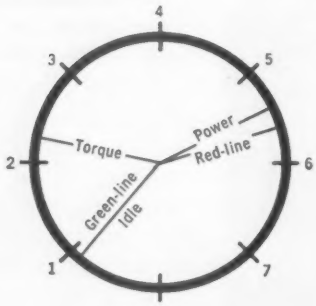
Road Research Report: PEUGEOT 404

Importer:	**Peugeot Inc.** **750 Third Ave.** **New York 17, N. Y.**
Number of U. S. dealers:	**564**
Planned annual production:	**115,000**
Value of spare parts in U. S.:	**$800,000**



SCALE ⅛

Steering Behavior
Wheel position to maintain 400-foot circle at speeds indicated.



Engine Flexibility
RPM in thousands

PRICES:

Basic Price	$2575 at East Coast Ports of Entry
Options fitted	none
Options available	none

OPERATING SCHEDULE:

Fuel recommended	Regular
Mileage	20-30 mpg
Range on 13.2-gallon tank	265-400 miles
Oil recommended	SAE 40 Summer, SAE 20 Winter
Crankcase capacity	4¼ quarts
Change at intervals of	1800 miles
Number of grease fittings	11
Lubrication interval	1800 miles

Most frequent maintenance: Drain and refill gearbox and rear axle—3600 miles.

ENGINE: (Inclined four)

Displacement	98.7 cu in, 1618 cc
Dimensions	Four cyl, 3.31 in bore, 2.87 in stroke
Valve gear	Pushrod ohv, inclined valves at 25° included angle
Compression ratio	7.3 to one
Power (SAE)	72 bhp @ 5400 rpm
Torque	94 lb-ft @ 2250 rpm
Usable range of engine speeds	900-5600 rpm
Corrected piston speed @ 5400 rpm	2780 fpm

CHASSIS:

Wheelbase	104.3 in
Tread	F 53.0, R 50.4 in
Length	173.9 in
Ground clearance	5.9 in

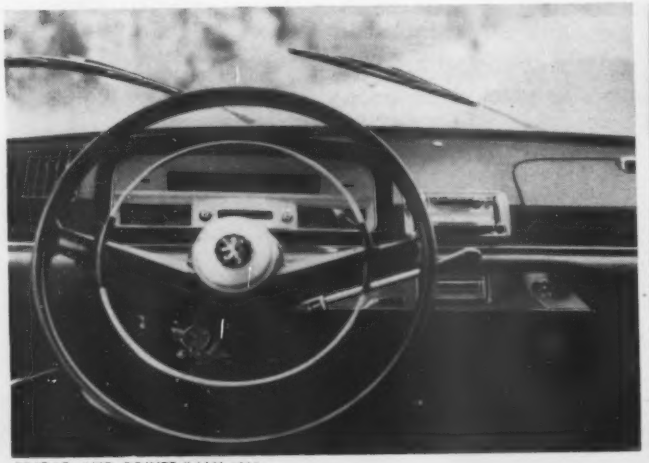
Suspension: F, ind., coil-strut with lower wishbone; R, rigid axle with torque tube, coils and panhard rod.

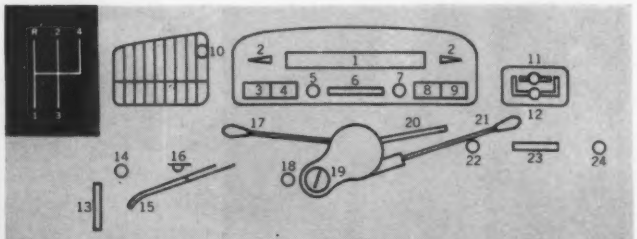
Turns, lock to lock	4.1
Turning circle diameter between curbs	31½ ft
Tire and rim size	"165" x 15; 15 x 4½J
Pressures recommended	F 20, R 23 psi
Brakes; type, swept area	10 in drums, 210 sq in
Curb weight (full tank)	2360 lbs
Percentage on driving wheels	47%

DRIVE TRAIN:

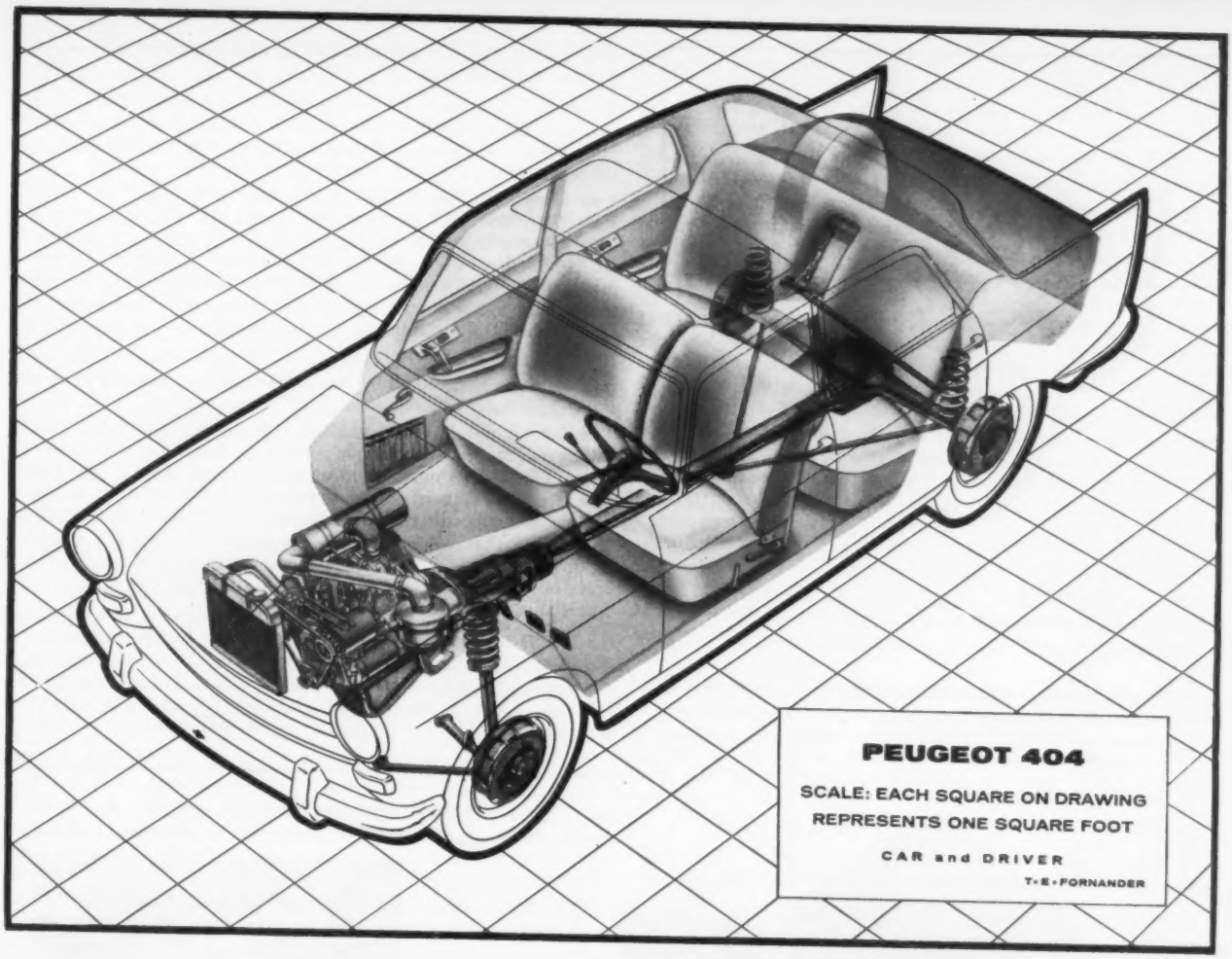
Gear	Synchro?	Ratio	Step	Overall	Mph per 1000 rpm
Rev	No	4.41		18.50	—4.0
1st	Yes	4.08	85%	17.14	4.3
2nd	Yes	2.21	56%	9.29	8.0
3rd	Yes	1.42	42%	5.97	12.4
4th	Yes	1.00		4.20	17.7

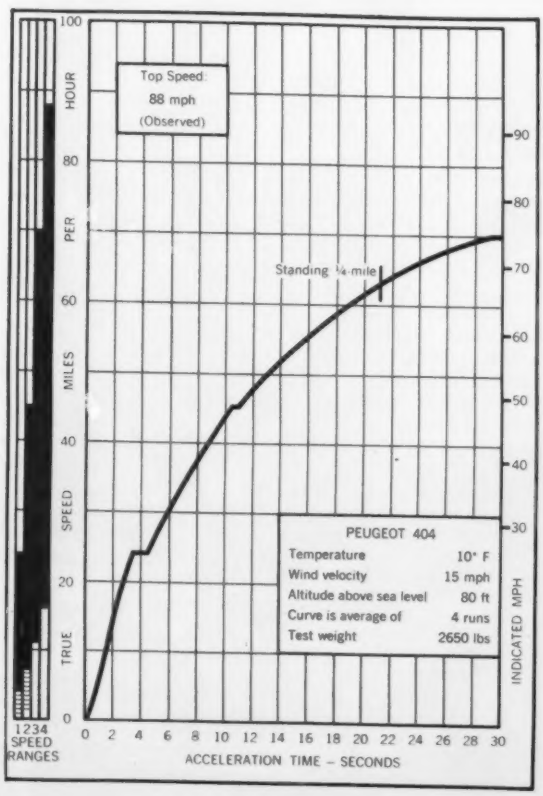
Final Drive Ratio: 4.20 to one.





1 Speedometer
2 Turn signal lights
3 Water temperature
4 Fuel gauge
5 Clock reset
6 Odometer
7 Trip indicator reset
8 Ammeter
9 Clock
10 Ventilator control
11 Defroster
12 Heater
13 Fuse box
14 Hood release
15 Handbrake
16 Parking light switch
17 Headlight switch lever
18 Choke
19 Ignition
20 Turn signal lever
21 Shift lever
22 Windshield wipers
23 Ashtray
24 Windshield washer


PEUGEOT 404
SCALE: EACH SQUARE ON DRAWING REPRESENTS ONE SQUARE FOOT
CAR and DRIVER
T•E•FORNANDER


Top Speed:
88 mph
(Observed)
Standing ¼-mile
PEUGEOT 404
Temperature 10° F
Wind velocity 15 mph
Altitude above sea level 80 ft
Curve is average of 4 runs
Test weight 2650 lbs
TRUE MILES PER HOUR
INDICATED MPH
1234 SPEED RANGES
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
ACCELERATION TIME – SECONDS

Porsche's Plans

C/D correspondent in Stuttgart, Günther Molter, interviews Ferry Porsche on the firm's upcoming full-scale assault on Formula 1. The new eight-cylinder engine, the use of drum brakes, and Porsche's early acceptance and development of the rear-engined race car are all points of discussion in this candid and exclusive conversation with the scion of a brilliant engineering heritage.

For some time there's been open discussion of new designs that Porsche intends to enter in Formula 1 racing. One hears, among other things, of air-cooled eight-cylinder opposed engines with Weber carburetors or fuel injection and desmodromic valve gear. What's actually true?

There's some truth in all the things you've mentioned. That is to say we're trying many things, but today we can't quite predict the final solution. We are keeping air cooling and building a multi-cylinder engine but it's not yet certain whether with injection or carburetors. At the moment we prefer the eight-cylinder layout, but we are developing our old engine further.

The new engine naturally requires a new chassis as well. Will this chassis differ substantially from that of 1960? I'm thinking primarily of the frame, suspension, and a very low silhouette.

Using the old engine, we will also undertake a number of improvements on the chassis in the course of development, yet it is interesting that the eight-cylinder is designed in such a way that it can also be installed in the chassis of last year's Formula 2 racing car.

Porsche has very efficient drum brakes at present. Will these brakes also be sufficient with the expected higher power? Will you remain with drum brakes or do you intend to employ disc brakes also?

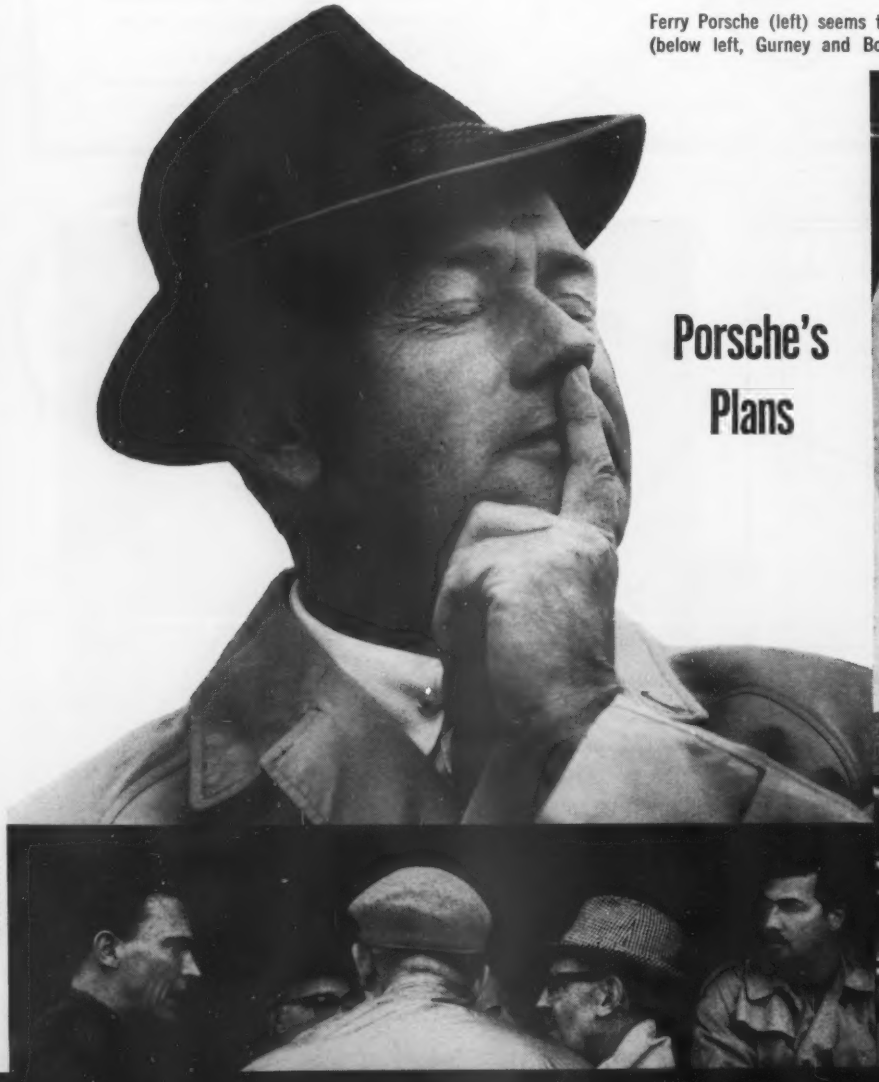
You know that we've had disc brakes under test for some time now, and also have entered sports cars with disc brakes in a number of races experimentally. Yet it's not certain now which of the two brakes will finally be employed. In the meantime we've further improved our present drum brakes so that at the moment the efficiency of both brakes is the same, while the weight of the disc brake is still higher.

Would the effective braking area of the drum brake be increased, or would the higher efficiency be obtained with a brake of similar construction?

The brakes wouldn't be enlarged, but it's been found that still greater efficiency can be reached by making small changes in the linings. You know, of course, that in the last race against Ferrari at Modena the drum brakes of the Porsche were better than the disc brakes of the Ferrari. The disc brakes that you're able to buy today are thus not yet so far advanced that we can replace our drum brakes with them. Perhaps we can replace our drum units with our own disc brakes, but that remains to be seen.

Do you feel that the minimum weight of 990 pounds is suitable? The way things look at the moment, engine development will be given far more attention in the new Formula 1 than in the old 2½-liter formula. If engine development is now forced at a higher pace, it's predictable

Ferry Porsche (left) seems to be deep in thought about his 1961 team's (below left, Gurney and Bonnier) chances against the new F.1 Ferrari.



WEITMANN

that the engine will also become heavier and thus the minimum weight requirement will not necessarily bring with it more sturdy chassis than the Lotus had, for example.

The 990-pound minimum weight was a concession to those who were not yet able to obtain new engines. I'm of the opinion that the 1100-pound minimum, which was originally specified, would have been the proper weight for a true Formula 1 racing car of 1½ liters. The 990-pound limit was, as I said, only a concession to those whose engines are not yet powerful enough to be able to keep up. It will indeed automatically evolve that the cars will become heavier with the new engines.

What power outputs do you expect in the first year of the new Formula?

Last year Ferrari had already appeared in Formula 2 racing with a true 1½-liter Formula 1 engine and the output reached by this car will also be attained by our new Formula 1 racing car. The power output will be in the vicinity of 180 bhp DIN, and the average speeds attainable will not be substantially different from those put up by the Formula 2 car in 1960 since that machine was lighter.

Why do you take part in Grand Prix racing, in view of the fact that sports cars are more closely related to the production program of your company?

In 1959, we built a Formula 2 racing car with the components of a sports car. Since sports cars are much closer to us, as you quite rightly say, we didn't design anything new. We have nevertheless determined that we can only obtain the best drivers for our factory team if we offer them the opportunity to take part in Grand Prix races as well.

You're certainly developing the new racing components with regard to their possible use in a later series production car, or at least a Grand Touring car; isn't that the case?

Our eight-cylinder is so designed that one day it naturally could also be employed in a sports car, as was the case, of course, with the present four-camshaft engine. Naturally it wouldn't be used for large production, but rather for the so-called sports-racing types and perhaps even for a Grand Touring car at some time.

Especially in its last year, the 2½-liter Formula brought a complete departure from the conventional racing car, and dominance of the light rear-engined car with a symmetrical weight distribution and a handling characteristic that didn't change substantially as fuel was consumed. Isn't this, however, merely the complete confirmation of a design direction that your father successfully utilized with the Auto Union racing car?

This question is very interesting for us, and I welcome a chance to make some remarks on this theme. For some time various publications have brought attention to the fact that all Grand Prix cars are now rear-engined, and regarding this fact and the advantages that derive from this construction the question has arisen: "Did Professor Porsche know all that as early as 1932?" We then sent these publications a patent application from the year 1932 in which the reasons why we built a rear-engined racing car are precisely spelled out. It describes a car with the fuel tank in the middle at the center of gravity, which provides the same weight distribution as the fuel is consumed as applies with a full tank; in which the masses are concentrated between the axles, and which has sufficient weight on the rear axle for propulsion – for, in the final analysis, it's the loading of the driven rear wheels that determines how much power the rear tires can transmit to the ground. Once again, the value of these perceptions has been widely extracted today. We, however, had already laid it out in the form of a patent in 1932.

Do you believe that even today, in spite of the great success of the rear-engined car, an automobile with the engine in the front would still have a chance?

At the race at Modena, it was shown that in terms of average speed there's no sizeable difference between the front-engined car and the rear-engined car. It appears, however, that the rear-engined car, viewed on the average, is now preferred in Grand Prix racing because it makes various things simpler. It's well-known that everything in technology can be solved. Surely one could design an equally fast car with an engine in the front. The question is only which conception is the most economical way of reaching the same result.

Who will drive in the Porsche Grand Prix team of 1961, or in other words, who has now definitely been engaged? It's known that Bonnier and Gurney have received a contract, or at least a written statement of your obligation. Then it was said of Hans Herrmann that he had received a similar promise from you, but no contract as yet. What's the situation with Moss?

As Herrmann rightly says, I've explained to him that he is a member of our Grand Prix team, and that's certainly true. The other drivers that you've named are also true. It's definite with Bonnier, and in all probability Gurney will also be with us. In 1961, with the new car, we don't intend to release any automobiles to private owners, and since Moss in any case wants to drive in the Walker team rather than in a factory team, that decision has thus been made.

Do you hope to be able to enter one of the new Formula 1 cars as early as Monaco?

I believe that these hopes are placed somewhat too high. In all probability we'll start at Monaco with the old car.

In 1961 will you also take part once again in the Coupe des Constructeurs for sports cars, and in the hillclimb championship?

We'll take part once again in the sports car world championship, as in recent years. Last year we ourselves no longer took part in the hillclimb championship, but only our customers instead. We always try to allow our customers to compete and only take part ourselves wherever it's not possible for a customer to win.

Do you believe that the automotive sport still serves in any sense to develop the series product, or is it merely another form of advertising, or only an acceleration of technical development?

In my opinion, the automotive sport still carries development forward, since, as you last remarked, it accelerates advanced development. It's this way: between a test on a proving ground or a dynamometer and a similar test in a race the human stakes are different. One is an "everyday thing" and the other is spurred on by sporting ambition.

Recently the Americans began to take more interest in motor sport, and certainly the Americans are of the opinion that the sport has contributed substantially to making the small European car popular in the U.S.A. It's well known, for example, that General Motors is testing a Chevrolet Corvette single-seater at the moment. I am not able to judge whether this project will really take part in races, or to what extent it's only a publicity measure. It is certain, though, that General Motors has learned and employed a great deal from its Corvette, and from the entire development of this sports car – today racing car – for its series products.

Will 1961 bring any revolutionary novelties with respect to your production program or will you only show detail improvements at Frankfurt?

Our automobile will be substantially unchanged. We'll stick to the two-seater sports car and will only introduce detail improvements in 1961.

As you know, the Americans have developed a taste for smaller cars as a result of the European imports, and the great success of the compact cars has been laid not a little to the groundwork which was accomplished by European imports. Do you feel this was the case also?

Yes, I'm also of this opinion. European cars have shown the Americans that there need not be just one size of automobile, but rather that different cars can be used for different purposes.

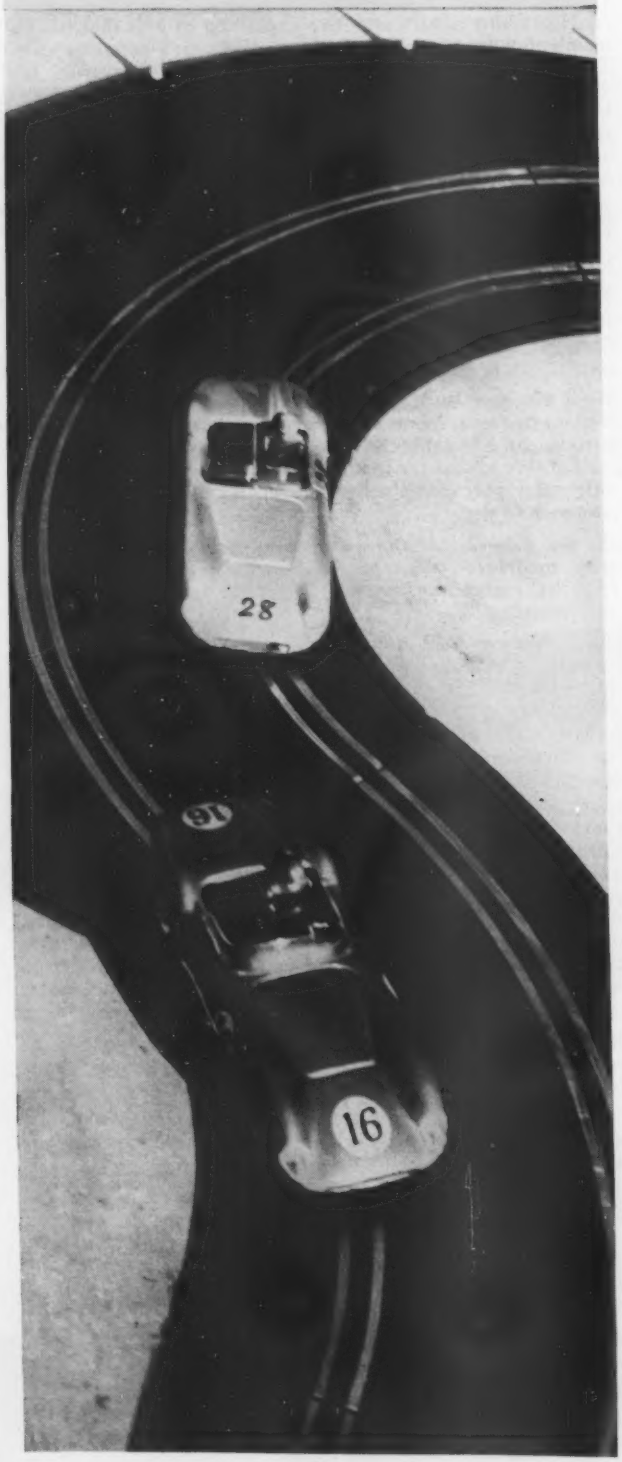
Has the decline of the export business in the U.S.A. also had an effect on your sales?

In no respect. Even today we have far too few cars to cope with the need for Porsches in America.

LIVING ROOM LIME ROCK

by OCee Ritch

Model car racing is one way of competing without bruising you or your pocket book. The only thing that might suffer is your ego when you lose the first race to the local "hot thumb."



► Now, just a minute, don't turn the page thinking this is an article intended for BOY'S LIFE that got into the wrong envelope. This is for the hard core of enthusiasts who have exceptional driving skill, a knowledge of mechanics and the behavior of road vehicles plus a strong competitive urge, the will to win and . . . $2.00.

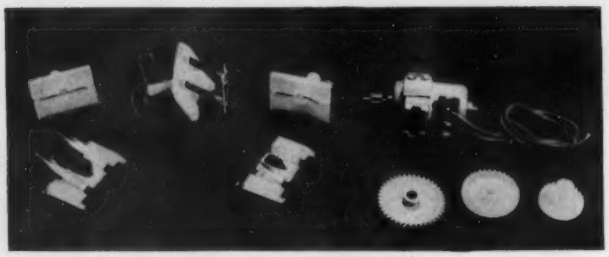
With the deuce you buy a model race car kit, assemble it, paint it, detail it and admire your skill (which, if you are really adept, may approach that of your neighbor's 11-year-old son). This act will fire you with enthusiasm and you will then either shell out $14.95 for a track on which to make this 1/24-scale beauty perform or you will intrigue a couple of friends and together you will make a larger investment in a convoluted layout that will span the living room rug. Soon the nights will be made hideous (for your neighbors) with cries and moans, accusations, beefs, protests and all the other attributes of good sportsmanship that characterize full-scale racing.

I know, because it happened to me.

It has been eight years since the first "rail-racing" model electric layouts made their appearance in England and about five years have passed since the initial efforts to duplicate the cars and track were made in this country. In that period the sport showed such promise that a number of commercial toy and hobby firms adapted or created products suited to it. Now there is enough happening that anyone entering the field can select his own level of participation to a wide degree, which, according to the precepts of club racing at any rate, should make the idea popular.

Regular readers of C/D will recall the story which appeared in the December, 1957 SCI dealing with Scalextric layouts and cars. This publicity introduced model racing to a wide audience that had no idea such a hobby existed. It emphasized the "package" or "ready-made" layout and hundreds or perhaps thousands of people gained an interesting pastime as a result. Many of them have probably relegated the cars and track to a closet and now only haul the

Scuderia Stewart all set to do battle on the neighborhood boards. The car is a Scarab from a Strombecker kit. Tool box is from a model truck.



Motor, gears, and pickups can be bought separately for building up a custom race car. Engine uses stepped-down (6-12 volt) house current.

set out on rare occasions. Others progressed to a new plateau which takes the fun up a notch and offers much more of a chance to exercise ingenuity.

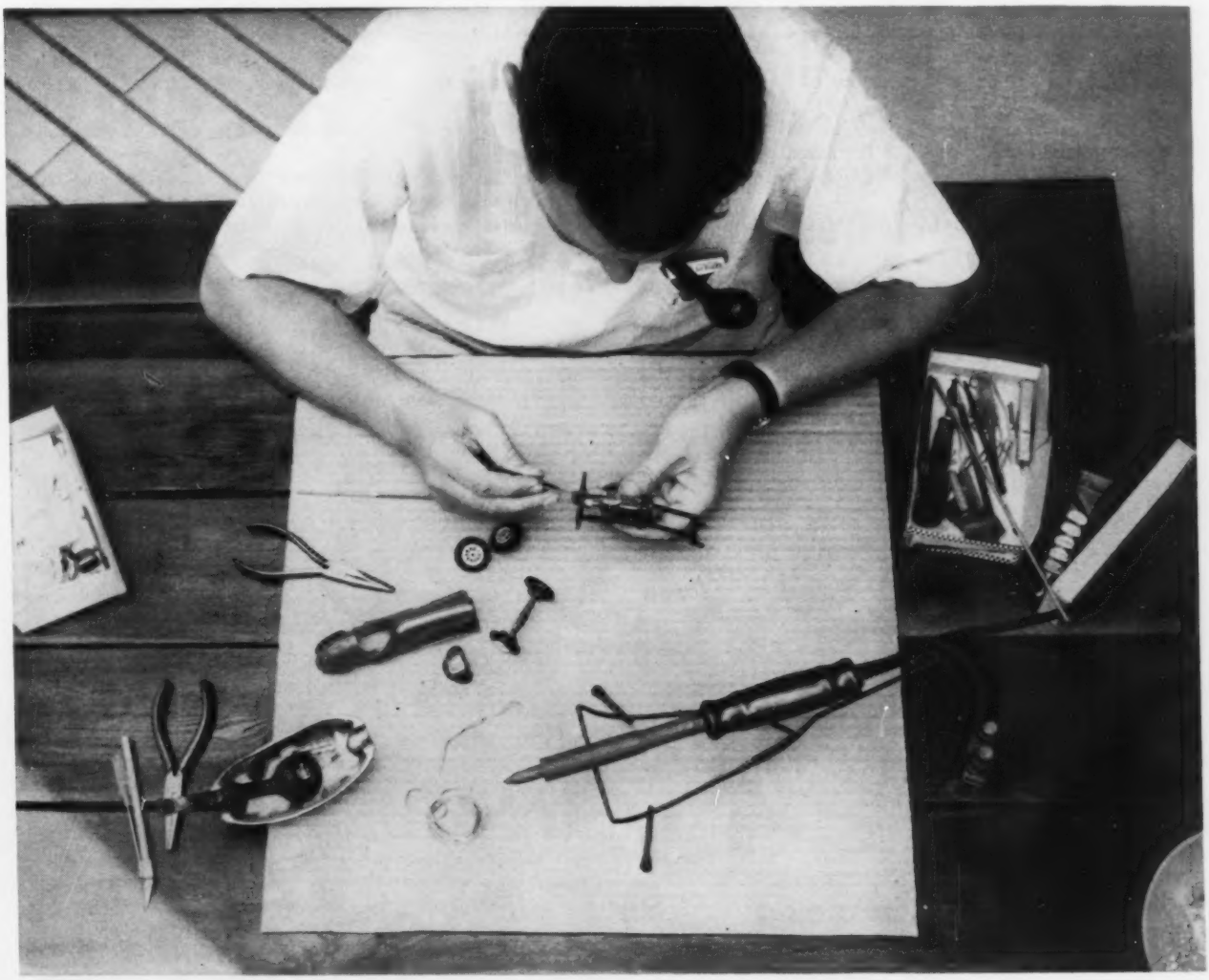
Although still referred to as "rail" racing, present mini-model competition is largely carried out on tracks whose electrical circuits are submerged in the track surface or flat on it rather than raised in the manner of a guide rail. The layouts range in size from ovals whose longest dimension is 52 inches and accommodating two cars to basement-clubhouse installations of six-car track incorporating as many details as one finds in an elaborate model train setup.

Power from 115-volt house current is fed through transformers, (6-12 volts) wired to the track's brass contact strips and through tiny "pickups" to miniature motors geared to axles of scale racers. The cars, guided by pegs or rollers running in the track's slots, follow the curves and straights only as long as the power, regulated by the operators, is consistent with conditions. Spinouts, crashes and incidents are the rule and, as with full-sized competition, there is a fine line between staying on the track or going into the trees.

In short, model racing bears little resemblance to model train operation (which might be assumed on surface acquaintance), except for the desire to maintain scale reality which afflicts so many hobbyists in both categories. But it does owe a lot to the sport of closed-course road racing. And, presuming that there are many more devotees of the latter than of the former who subscribe to this publication, let us relate to that pastime.

The $2.00 mentioned initially has been the hooker for a lot of enthusiasts who like to build models. Strombecker Mfg. Co., Moline, Illinois, dispenses 1/24-scale plastic car kits complete with 6-volt motor for this small sum. Duplicates of the Scarab, Aston Martin and D Jag sports cars, Ferrari, Lancia, Maserati (250F) and Mercedes (W196) Grand Prix machines are available. Executed in remarkable detail, the miniatures measure approximately 6¾ inches overall and are about 2½ inches wide. They are complete with helmeted and goggled drivers, rear-view mirrors, number decals and insignia. Rubber-tired wheels are mounted on wire-spoke or disc knock-off wheels and each has a steerable (Ackermann) front end. Assembling and painting time usually requires a couple of evenings. The pickup and track guide developed by Strombecker is a molded nylon "fin" or shoe flanked by brass brushes whose inherent springiness keeps them in contact with the track strips. The shoe is free to move from side to side as the curve of the track and attitude of the car dictates. This lateral movement steers the wheels through a tie-rod. The effect is realistic as well as a help in controlling the vehicle.

Strombecker track is molded plastic made in sections 12 inches long for the straights with 60° curve sections. The 7-inch-wide pieces lock together to form a rigid unit which



A squirrel cage chassis is fabricated by the author for use with a Merit Maserati 4 CLT model. Frame is built up from thin-walled brass tubing.

can be kept in assembled form and moved from place to place. This is handy for storage, as against a garage or basement wall.

Track sections, both straight and curved, are $1.50 each when purchased individually but a basic track of ten pieces plus 4 connecting wires is available at $14.95. You save $1.05 with this deal because the wires are $1.00 separately. A 10-section track forms a 52 x 28-inch oval for two cars. By judiciously supplementing this beginner's setup with 2 straights and 6 curves a snaky, turns-both-ways road course can be fabricated. This removes the advantage dealt out to the car on the inside track of the oval.

Strombecker's transformer and control button arrangement ($14.95) provides power supply and "all-on" or "all-off" throttle for the individual cars. Each operator grasps a kill-button-type hand switch and presses the trigger for juice. Driving technique calls for holding the throttle to the floor up the straights, shutting off just before the curve and little blips of power through the turns. If you don't think this tests your reaction time, try it! Track fencing, at about 25 cents per foot, helps keep the more reckless drivers from shooting off into the kitchen.

Scalextric, now in about its sixth year of development, operates on a non-steerable front wheel principle and is a little more expensive. The earlier sets, as mentioned in the SCI article, utilize a tapered wheel riding in the track slot and holding the front wheels just slightly above the surface. The guide roller is split by insulating material, one side acting as positive and the other negative. Free to swivel, the wheel is mounted in the front of the car's chassis and has the same effect as steered front wheels.

For last season Scalextric brought out two new cars, Lotus Formula 1 and Vanwall, with a different pick-up guide arrangement as well as new Triang motors which replace the older molded-nylon type. The improved pickup consists of a nylon peg and two wipers of a heavy wire mesh. Gone is the roller.

The cars are totally unlike the Maserati and Ferrari "tinplate" stampings previously offered and are molded in plastic. Handsome, but not so detailed as Strombeckers, the Scalextric cars offer nothing to the individual builder as far as handwork is concerned. They are complete upon receipt.

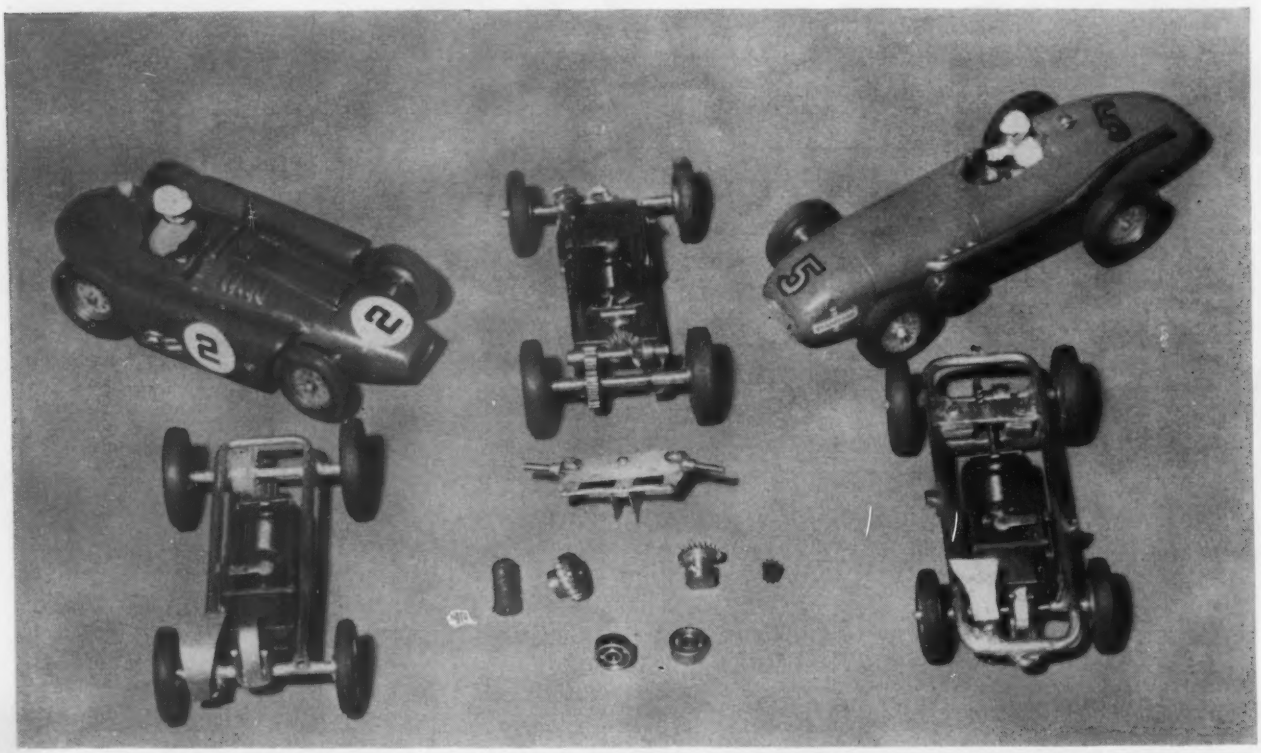
Split along the chassis line (if there were a chassis) the Scalextric Vanwall and Lotus come apart to reveal the substantial Triang powerplant coupled to the rear axle through metal ring and pinion gears which seem more substantial than their nylon counterparts found in Strombecker kits. As a 12-volt unit the motor is considerably stronger, naturally, and power-to-weight ratio should be impressive.

The scale to which Scalextric models are built is 1/29 and track sections are 6 inches wide by 14 inches long. The track itself is of rubber composition and rather on the flexible side. It cannot be permanently joined without a base. Curves are in 45° segments, thus four are required to make a 180° turn, compared with three of the Strombeckers, but two can be joined together to make a 90° turn not possible with the American set. There are also short, straight pieces, a bridge and a chicane section available for the Scalextric sets to add interest.

The basic Scalextric oval is 57 inches long, 29 inches wide. In conjunction with two cars (at $6.50 each), fencing and two variable hand controllers it is priced at $29.95. The variable controllers have supplanted the on-off buttons formerly furnished but Scalextric still regards the battery power supply as the mainstay of its sets. The required dry cells are housed in a small "Powerhouse."

Most enthusiasts replace the cells with one or two Aristocraft or Marx variable transformers. With these it is necessary to use the pushbutton or controllers but with a transformer connected to each track a true "throttle" effect can be obtained by twisting the knobs. Greater speeds are possible, too, since the motor's rpm rate is in direct relation to the voltage.

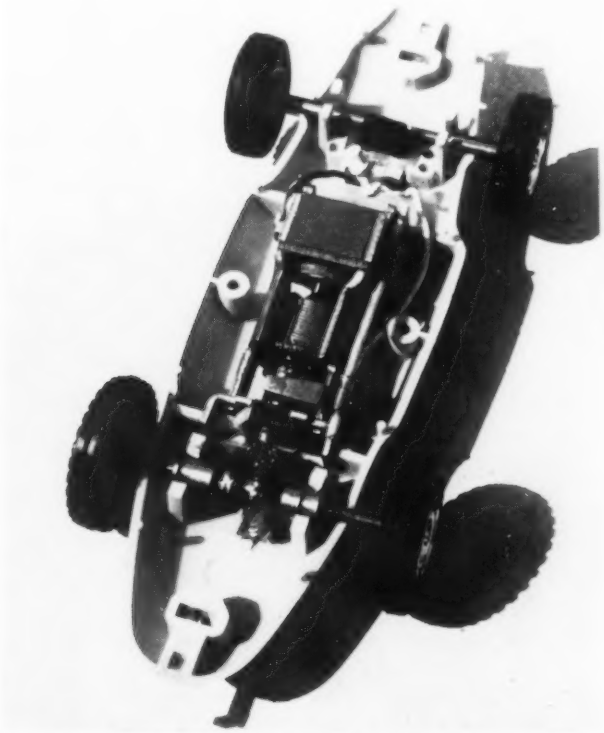
From the basic oval Scalextric "sets" go up to 10 curves, 5 straights, a fly-over bridge (permitting a figure 8 arrangement) and a chicane set. Individual pieces are priced at



G. P. car and Indianapolis roadster along with three tube chassis were all built by members of the active Kalamazoo Valley Miniature Auto Club.

$2.00 for a full straight (14 inches long), $1.75 for a curve section, and $1.25 for the short straight. Two of the figure-8 sets combined will permit the development of a layout with terrifically fast six to eight-foot straights. A challenging circuit, not using all available trackage from two sets, occupying an 8 by 8-foot space is shown in one of the accompanying photos.

With an inherent difference in design and voltage it seemed that friends whose track choices differed could not compete without investing in extra cars. But it was discovered



Plastic chassis mates well with Triang motor and metal gears. To keep TV viewers happy a suppressor (white, wired plug) is fitted to circuit.

that the Strombecker pickup could be modified to run in the shallower Scalextric groove and that the little 6-volt motors will stand intermittent 12-volt operation. The track is a light drive fit for two Strombecker cars, it must be admitted, but this adds spice. New Scalextric machines can have the wipers extended by soldering small pieces of sheet brass of a width sufficient to contact the more spread-apart Strombecker contacts. And since the Strombecker transformer provides for both 6 and 12-volt operation, the Triangs can be set humming.

Interest at this level, even assuming that the enthusiast buys and assembles all the available trackage that will fit into his available space, keeps racing activity in the *game* category. To qualify as a *hobbyist*, you have to design and build your own stable of cars. This is, of course, still more expensive but, likewise, far more rewarding and your total investment could hardly approach that of a couple of weekends of racing full-sized playthings.

Tom Cook of Kalamazoo, Michigan, and his associates in the Kalamazoo Valley Miniature Auto Club, must be classed as the leading hobbyists in this country. Soon after articles on model rail racing began appearing in British magazines, Tom's group was formed, built a fine gaggle of cars and a big four-lane up-hill-down-dale track. Their progress was so rapid that the club sent a number of cars to compete in the Second Southport International Grand Prix (Southport

PHOTOGRAPHY: STEWART

This is a typical "enthusiast's" layout. It is built up from parts of two Scalextric tracks, and incorporates a number of fast and slow bends.

being the English home of rail racing) where they nabbed second and fourth. In turn, their Grand Prix events have been hosts to cars from various British clubs.

A set of International Regulations covering specifications makes such an interchange possible and, although the raised rail system seems to be dying out in favor of grooved track, the requirements make excellent standards for those interested in model construction. The 1/32 scale to which these cars are built provides "more track" in a limited space than the larger 1/24 scale. A lack of accurately-scaled plastic bodies in this size, however, requires that the hobbyist carve a balsa miniature as well as fabricate his own chassis.

1/24th scale, however, has become a snap . . . if you don't care to carve balsa . . . . because Merit (J & L Randall Ltd.) model kits are injection molded precisely to scale and as detailed as anyone would want. Vanwall, Lotus (Mk XI), Connaught, Maserati (4CLT/48) and others provide a selection of body styles to please critical constructors. They will also hob-nob with Strombecker cars and are not out of place on Scalextric track.

These are not electrified, bear in mind; the kits (at $2.25) furnish only a body shell and detailing. It's up to you to devise the chassis, steering and power train.

In either scale, chassis can be built out of sheet brass bent into a simple pan, or two brass angle strips for frame rails bolted together with tubing spacers or fabricated from 1/8-inch and smaller brass tubing. Tools needed are few and simple: a bench vise, needle-nosed pliers, soldering iron, small files, screwdriver plus pencil and paper. The vise can even be dispensed with if you have a couple of C-clamps. The brass is available at hobby shops like Polk's where you will also find motors and assorted fascinating components.

The best way to begin is to pick out a kit that suits your aesthetic nature and build the chassis to fit it. Lay out the wheelbase, the length and width possible plus the profile of the body on a piece of white cardboard or heavy paper and decide which type of frame best suits the body. The second consideration is the type of pickup to be employed and the third matter concerns the motor.

Strombecker's motors and rear axle assemblies are about right for any Merit kit as long (*Continued on page 108*)


PEUGEOT

only once in every decad

ade a new Peugeot...

for
facts
and
features
turn
page

presenting the 404

LIFT PAGE OUT

A continuity of excellence marks the 72-year history of Peugeot automobiles. In the Forties, it was the 203. In the Fifties, the 403. The latest expression is the 404. A new engine was designed for this car. It is a four cylinder, overhead valve 1618 cc engine which produces 72 brake horsepower at 5400 rpm. It is mounted at 45 degrees to lower the hood line and improve visibility. Canting makes engine components easier to service, too. Engine performance is improved by a new automatic fan clutch. When engine temperature drops below 167°F, a thermostat automatically declutches the fan—releasing 5 hp. Engine drag is lowered, gas economy increased 6%, and fan noise eliminated. Should the temperature reach 183°F, the fan cuts in. A new four-speed transmission was developed for this car. Fourth gear is direct drive. All forward gears, including first, are synchromesh. The 404's performance will please the motor enthusiast. A favorable power-to-weight ratio (31.9 lbs. per hp), high torque at low speeds (maximum occurs at 2250 rpm), coil spring suspension all-around, and precise, rack-and-pinion steering makes the 404 remarkably easy to handle; top speed is 90 mph. The 404 has a ride that is deceptively soft, yet cornering is very flat. The 404 is maneuverable; its turning circle is just 31 feet, 7 inches. "Body styling that will undoubtedly become a classic in the years to come" says *Car and Driver* (formerly *Sports Cars Illustrated)* about the 404. It is a pleasing blend of the modern and the conservative: form follows function in the 404. Ornamentation is at a minimum (and what there is, is stainless steel). A luxury car with airliner-type reclining seats, sliding metal sunroof and deluxe interiors, the 404 is inexpensive to own. You can reasonably expect 30 mpg, very low maintenance, 40,000 miles on a set of tires and no mechanical trouble. The 404 has no optional extras. Accessories conservatively valued at $525 are installed at the factory and included in the fully-equipped price of $2575 (East and Gulf Coast P.O.E.). They include sunroof, 4-speed transmission, heater-defroster, whitewall or Michelin X tires, reclining seats, cloth or leatherette upholstery, automatic fan clutch, electric clock, padded dashboard, windshield washers, trip mileage counter, outside rearview mirror, bumper guards, arm rests, sun visors, and others. The 404 does not replace the 403. It is an addition to the Peugeot line. Both cars will be sold and serviced by over 500 Peugeot dealers throughout the U.S., Canada and Mexico.

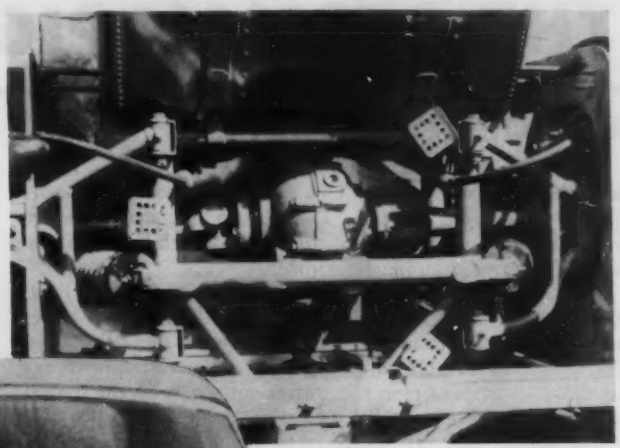
PEUGEOT

PRONOUNCED "POOJ-OH"

For illustrated brochure on the new 404 write to: Peugeot, Inc., 750 3rd Ave., N. Y. 17, N. Y. For overseas delivery, see your dealer or write: Peugeot, Inc., Box 158, Long Island City 4, N. Y.

Styled by Michelotti and bodied by Ghia, OSCA's latest production prototype is based on the Fiat 1500 engine and chassis, and weighs 2110 pounds dry. Amadori wheels cover Girling disc brakes in front and drums in the rear. It's hoped the car can sell for under $5000, but $5500 seems more probable.

Coil-and-wishbone independent rear suspension is used on latest 1600 cc OSCA sports-racer (shown at right) and on new OSCA G.T. coupe, and may be fitted to this roadster in future. Wheelbases differ, as follows: sports-racer, 82.8 inches; roadster, 88.9 inches; coupe, 92.3 inches.



ELEGANT OSCA

The Maserati brothers aspire to higher production.

PHOTOGRAPHY: FOTOCARS

Under the hood is the basic Fiat 1500 twin-cam, with OSCA's own cylinder head using downdraft porting with two two-throat Solex carbs. Developing 105 DIN horsepower between 6000 and 6500 rpm, it's expected to drive the convertible at 115 mph. Gearbox is four-speed, fully-synchronized unit.

THE AFRICAN PIG

BY ROBERT G. LURIE

► What gets me is these kids who think being a factory driver is just one big lark. They figure ten, maybe twelve races a season, and the rest of the time you drink champagne while Brigitte Bardot massages your back.

Now, you know better. It's hard enough to win races. First, the car has got to go. But even before that you've got to get to the race course, and the car has got to be there, and you've got to be able to sit in it. And other simple things like that. Also, it's better not to run out of gas on the second lap, like the whole team did at Le Mans.

But racing isn't all there is to being a factory driver. Because you work for Old Man Pignatelli like twelve months a year, which means you drive for him in races, you drive for him in test machines, you drive for him when he wants to run downtown for a nice pizza pie, and you drive for him when he says "Go deliver the new three-liter to that movie star who just arrived in Rome."

Sounds simple, the last part, doesn't it? Well, it should be. I don't even mind paying for the gas, if I can get away from the factory for a couple of days. Signor Pignatelli doesn't know it, but I swiped his Supercortemaggiore credit card over a month ago.

But this delivering to customers can get very wearing indeed. Let me give you a forinstance. Not long ago I'm feeding my face in the *trattoria* around the corner when they tell me Il Signore wants to see me quick-quick. Turns out a very special Pig has just come in from the coachbuilders, and seeing how it is already six months late on delivery, I've got to take it and deliver it in person. Also, since I speak English like an Englishman (because I was brought up in East Harlem) I was the only guy to explain the car to this client. Seems he couldn't speak any of the usual languages around, but he had been to Oxford, or Cambridge, or the London School of Chiropody — one of those things. What do I mean by "couldn't speak the usual languages?" Well, that's getting ahead of the story — but let me tell you the guy was great in Swahili, and a regular Mort Sahl in Amu-amumba.

This special Pig was some Pig. It was a regular sports series chassis, except lengthened and strengthened in the back to support the air conditioning unit behind the differential casing. And it had big knobby tires on the rear, like off of a jeep. It was the coachwork that gassed you, though.

Every bit of brightwork was gold-plated — even the wheel spokes. The hubs, of course, were solid gold, but drilled for lightness.

The damned thing had door handles, too, so they'd have more places to gold plate.

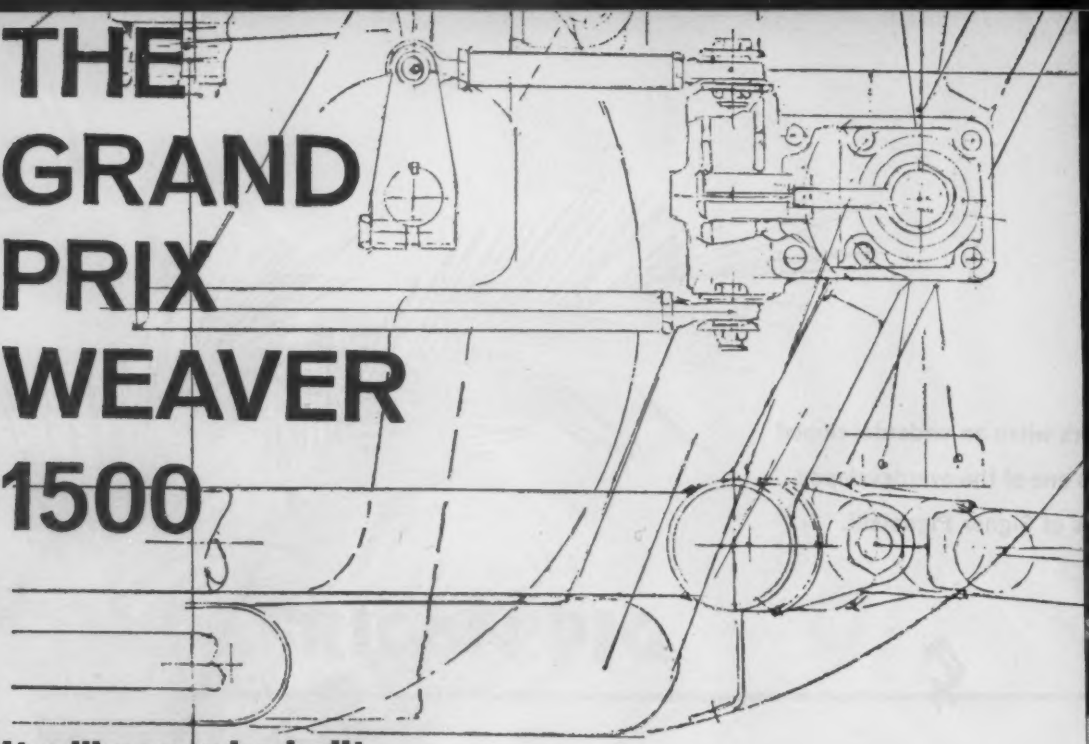
The bronze and gold scroll work on the edges of the windshield gave the car a kind of Victorian look, but this was counteracted by the tribal chief's umbrella which was mounted where the roll-bar had been.

The space behind the seats had been enlarged to admit a strange apparatus that looked for all the world like a still. And that's what it was — a palm wine still. Seems that the preparation of this beverage is the sacred and exclusive right of chiefs in certain parts of the world, and they've got to keep up production even when they're on the move.

Despite all this, the coachbuilder *(Continued on page 120)*

The U.N. totters when an underdeveloped country buys one of the overdeveloped creations of Signor Pignatelli.

THE GRAND PRIX WEAVER 1500



It will never be built, but it's a tribute to the skill of a fine designer. C/D's editor discusses this clever concept of a car for the 1961 Formula.

DOLIN

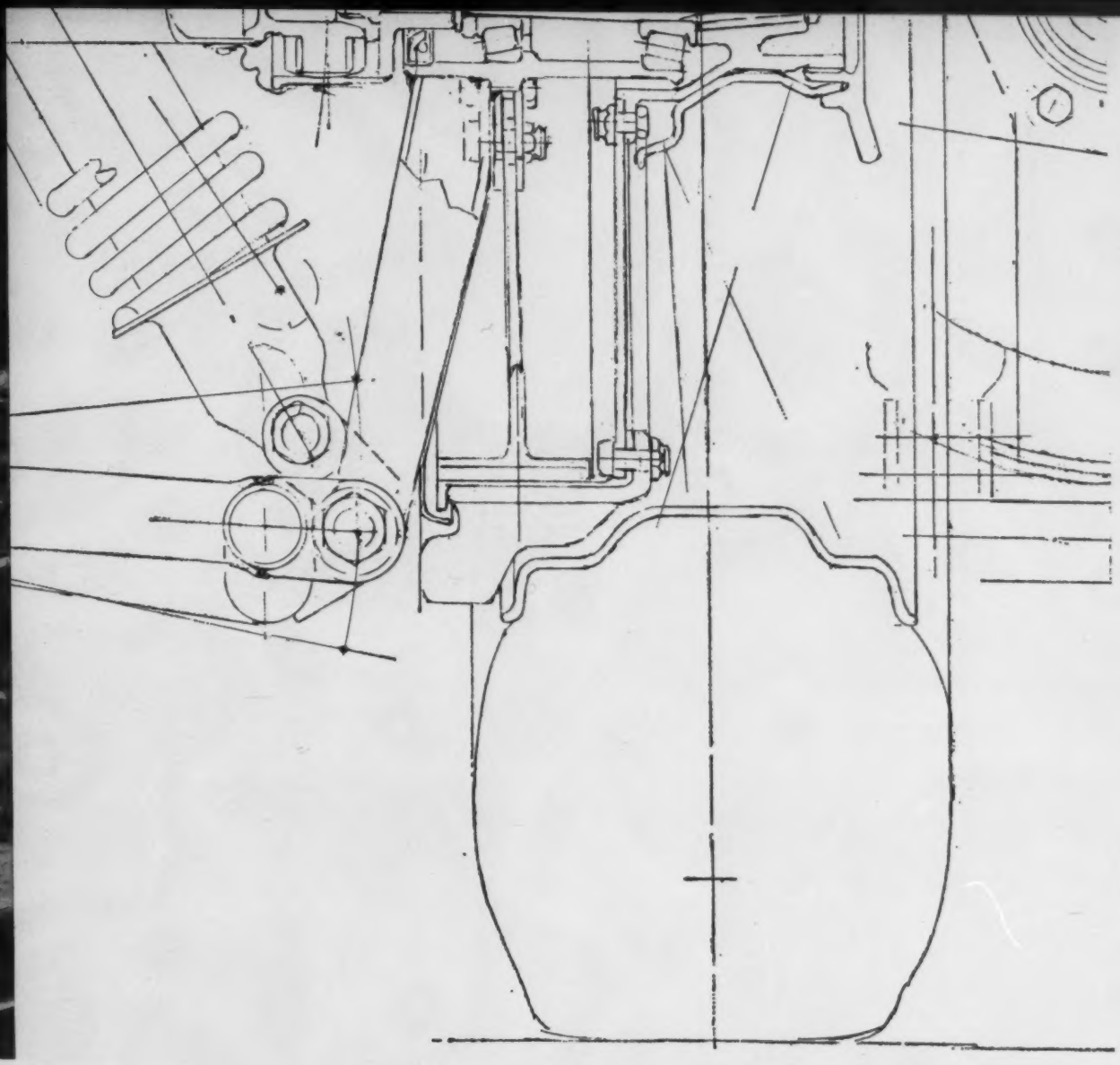
► Doubtless there are other men in this country who can sit down at the board and draw up complete road racing machines, but few besides G. Briggs Weaver have seen their brainchildren built and raced in international competition. From October, 1951 through 1956, Briggs Weaver was chief engineer of Briggs Cunningham's valiant attempt to win Le Mans for America. Since then he's kept his hand in by creating racing cars on paper, his latest and most elaborate project being the one you see here: a Grand Prix car according to the new 1½-liter Formula 1.

The artistry that shows in these lines and designs doesn't come about by accident. Mr. Weaver once studied sculpture at the Rhode Island School of Design, then spent four years designing silver for Gorham. Through a series of interlinking jobs after the first war, he found himself designing bodies for E. Paul du Pont's du Pont automobile. This lasted until 1929, when du Pont wanted a new chassis design and asked Briggs Weaver to come down to Wilmington, Delaware and lay it out for him. One of Briggs's first projects was the special Indy car built for Charles Moran in 1930, followed by the Le Mans du Ponts, which were essentially rebodied stock machines.

In 1930 the du Pont operation was moved into the ground floor of the Indian motorcycle plant in Springfield, Massachusetts, and through a series of circumstances Paul du Pont became the owner of Indian. After he finished the last Model H du Pont for the New York show in 1931, Briggs Weaver was moved upstairs and put to work designing Indian cycles. He held the post of chief engineer of Indian for nearly twenty years, until he retired in 1950.

That would have been a well-lived life for most men, but not for Briggs Weaver. His son is George Weaver, one of the modern pioneers of road racing in America and present major domo of Connecticut's Thompson Raceway. George was elected one of the relief drivers for Cunningham's 1951 assault on Le Mans, and on his arrival at the Florida factory to try the car in May, 1951, he encountered a certain amount of confusion in connection with the Bill Frick-designed C1 and C2 Cunninghams. George suggested that his father might be willing to sit in and supervise the design side, a suggestion that was welcomed by both Briggs C. and Briggs W. The senior Weaver served from then on as interpreter of the design desires of the Cunningham team members, notably Phil Walters, drawing up cars around the engines supplied him. His finest project was the least successful: the Offy-powered C6R Cunningham, one of the most lovingly designed and executed cars we've ever seen.

One clear carryover from the C6R to this car, which we'll call the Weaver 1500, is the design of the drum brakes — a type Weaver chose instead of discs because he's more familiar



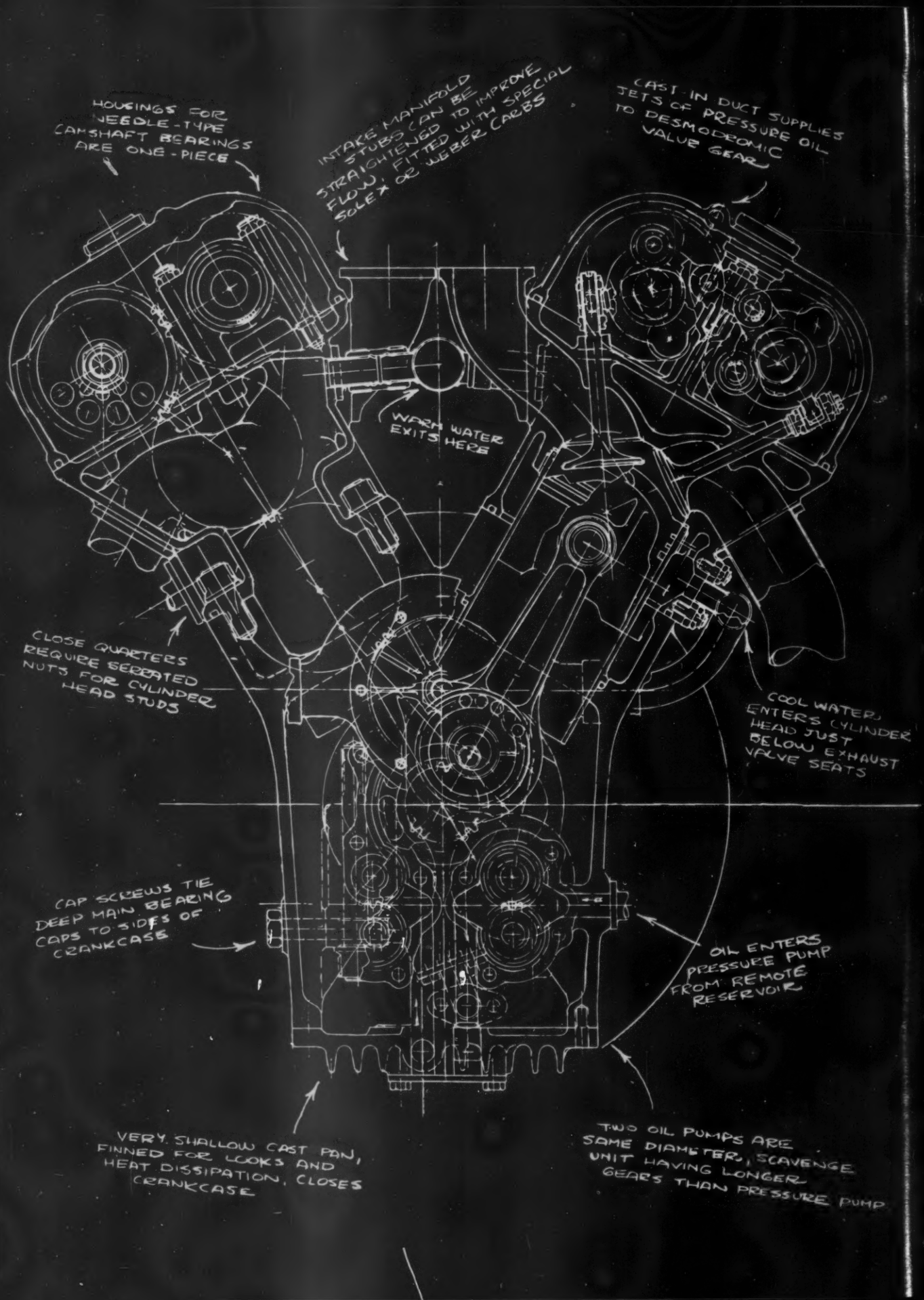
with them. Other features like the rear engine, V6 layout, desmodromic valve gear and roller-bearing bottom end are used because they contribute to the design, and also because Briggs Weaver either hadn't tried drawing them or enjoys drawing them!

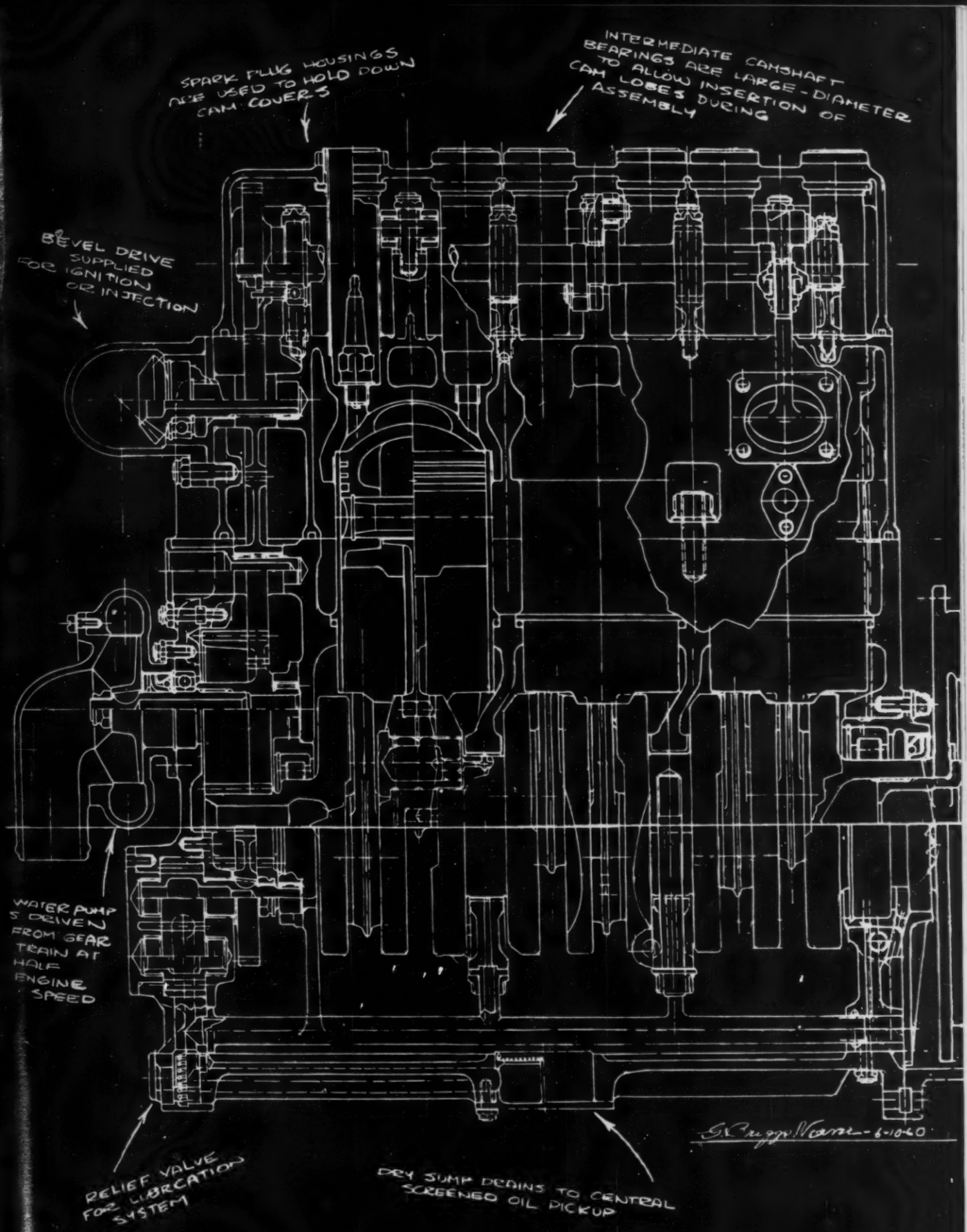
The 1500 engine is a beautiful example of what Weaver calls "compacting" – the reduction of every part of the design to minimum possible size as a result of long and careful study. A key part is played by the material chosen for the cylinder heads, called "Avialite", an alloy of 90 percent copper, 9 percent aluminum and 1 percent iron produced by the American Brass Company. It offers fine conductivity, combined with strength and wear-resistance such that valve seat and guide inserts are not required. It's naturally heavier than the usual aluminum alloy, but Weaver feels its castability is so good that the wall thicknesses and the resulting weight can be held to an absolute minimum – even thinner than the sections shown in the drawing, with expert foundry technique.

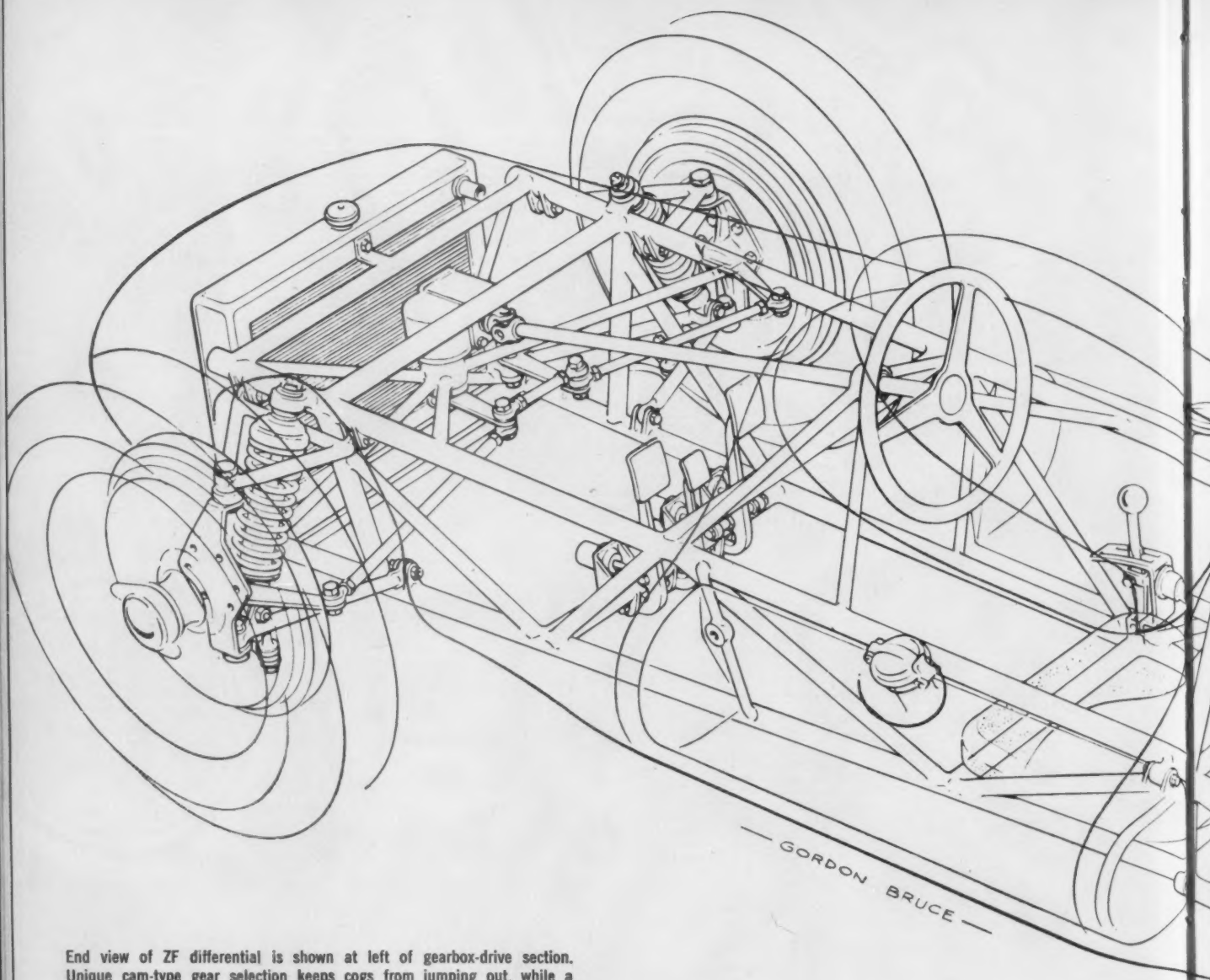
Slim steel cylinder liners screw into the heads and are tightened down against single O-ring seals in the light-alloy block/crankcase casting. Serrated cap screws, some not too accessible, bind these main castings together. The crankcase is extremely deep, extending down all the way to a finned cover plate at the bottom. Deep valve gear cover castings top the cylinder heads, and are neatly held in place by rings screwed down on the tops of the spark plug access tubes, which in turn are brazed to the heads.

Under the covers are twin camshafts, carried in three needle bearings and one ball bearing each, and a completely novel kind of desmodromic valve gear. Separate cams for opening and closing are provided, as you've probably seen before, but they actuate the valve through rollers mounted on a single needle-pivoted arm – completely encircling the cams – instead of the more usual separate finger and closing rocker. Location of the cam is half-way between the pivot and the valve, meaning that the valve's amplitude of motion is twice that of the cam, and meaning that the unit stresses at the cams and their needle-bearinged rollers will be on the high side.

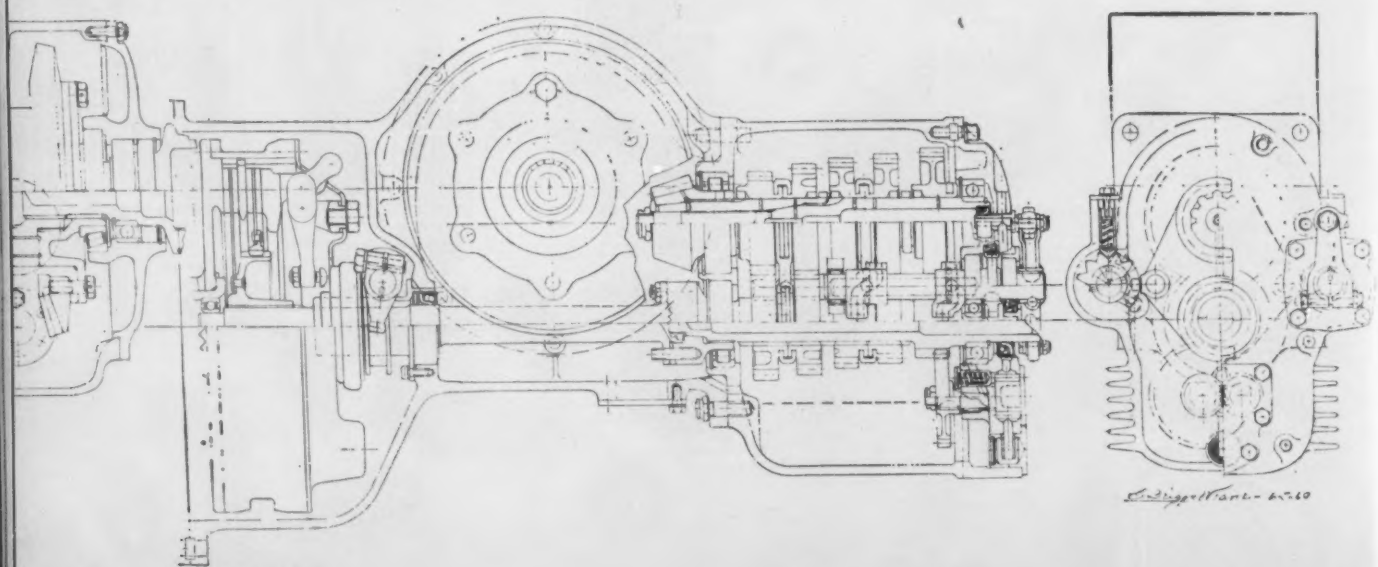
Total clearance between opening and closing cams is set by fitting rollers of different diameters, in the shop, this being an adjustment that should stay put for a while once it's done right. The adjustment at the valve itself is handled by a threaded valve stem and a straightforward arrangement of nuts. The whole desmo mechanism for a given head is symmetrical around the cylinder centerline, and the cams are counter-rotating to guarantee identical working conditions for both intake and exhaust. Demountable pivots are used for the actuating arms, so the *(Continued on page 80)*

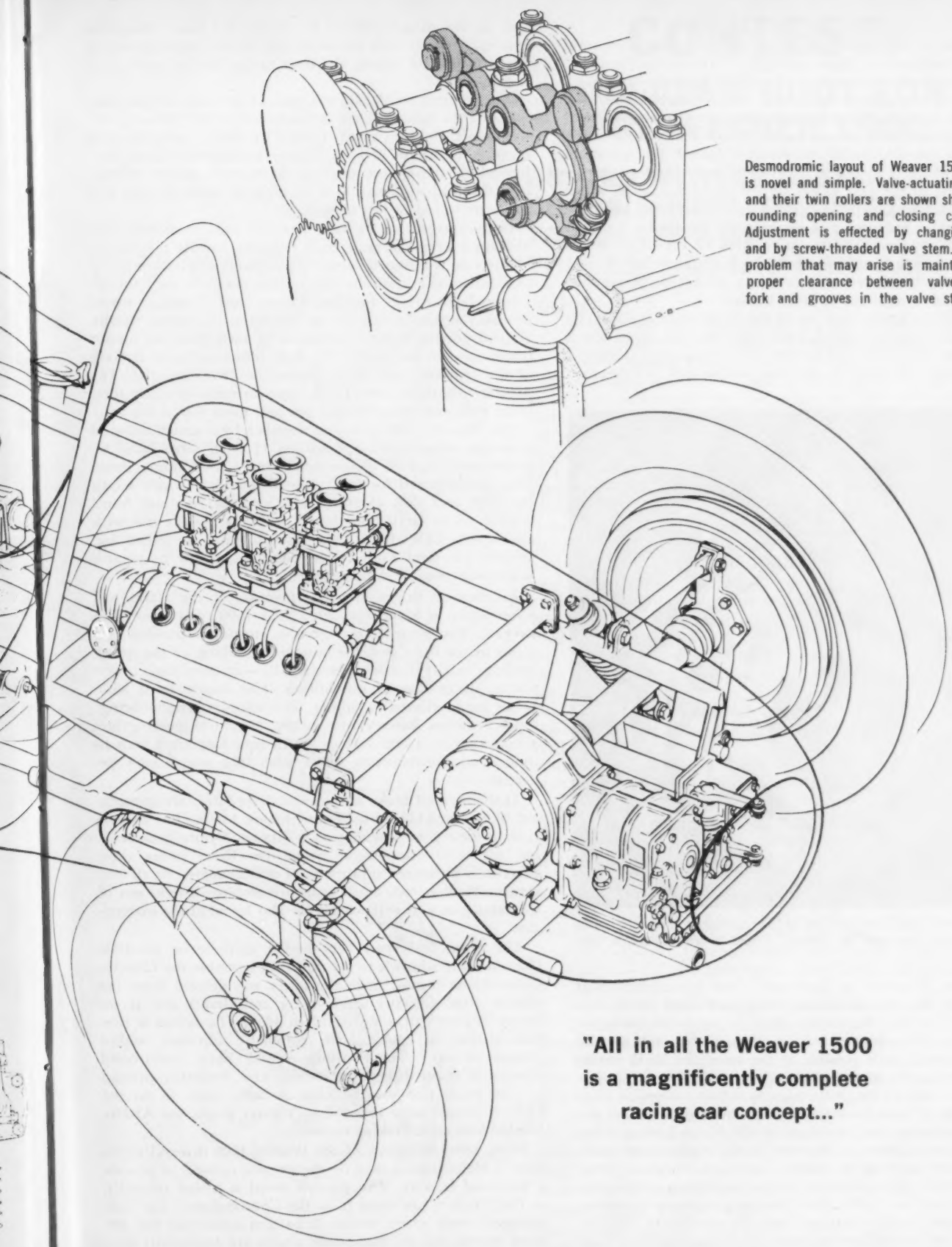

HOUSINGS FOR NEEDLE-TYPE CAMSHAFT BEARINGS ARE ONE-PIECE
INTAKE MANIFOLD STUBS CAN BE STRAIGHTENED TO IMPROVE FLOW, FITTED WITH SPECIAL SOLEX OR WEBER CARBS
CAST-IN DUCT SUPPLIES JETS OF PRESSURE OIL TO DESMODROMIC VALVE GEAR
WARM WATER EXITS HERE
CLOSE QUARTERS REQUIRE SERRATED NUTS FOR CYLINDER HEAD STUDS
COOL WATER ENTERS CYLINDER HEAD JUST BELOW EXHAUST VALVE SEATS
CAP SCREWS TIE DEEP MAIN BEARING CAPS TO SIDES OF CRANKCASE
OIL ENTERS PRESSURE PUMP FROM REMOTE RESERVOIR
VERY SHALLOW CAST PAN, FINNED FOR LOOKS AND HEAT DISSIPATION, CLOSES CRANKCASE
TWO OIL PUMPS ARE SAME DIAMETER, SCAVENGE UNIT HAVING LONGER GEARS THAN PRESSURE PUMP


SPARK PLUG HOUSINGS ARE USED TO HOLD DOWN CAM COVERS
INTERMEDIATE CAMSHAFT BEARINGS ARE LARGE-DIAMETER TO ALLOW INSERTION OF CAM LOBES DURING ASSEMBLY
BEVEL DRIVE SUPPLIED FOR IGNITION OR INJECTION
WATER PUMP IS DRIVEN FROM GEAR TRAIN AT HALF ENGINE SPEED
RELIEF VALVE FOR LUBRICATION SYSTEM
DRY SUMP DRAINS TO CENTRAL SCREENED OIL PICKUP



End view of ZF differential is shown at left of gearbox-drive section. Unique cam-type gear selection keeps cogs from jumping out, while a built-in oil pump feeds pressure lubricant to mainshaft at top of box.





Desmodromic layout of Weaver 1500 engine is novel and simple. Valve-actuating stirrups and their twin rollers are shown shaded, surrounding opening and closing cam lobes. Adjustment is effected by changing rollers and by screw-threaded valve stem. The only problem that may arise is maintenance of proper clearance between valve-actuating fork and grooves in the valve stem collar.

"All in all the Weaver 1500 is a magnificently complete racing car concept..."

(*Continued from page 75*)

cams can be assembled within the arms and the whole works bolted down to the pylons along the center of the head.

Symmetrically inclined at 35 degrees from the centerline, the valves are generously sized at 1⅝ inches for the intake and 1½ inches for the exhaust. Intake port diameter increases from 1.22 inches at the outer end to 1.46 inches at the valve, where a gas velocity of 260 feet per second, for maximum power, would correspond to 10,400 rpm. Velocity at the outer end of the port would be 370 fps at this speed, which should augment inertia ramming, and the 195 fps gas speed at the valve indicates that peak torque should be expected around 7800 rpm. With either carbs or injection, Briggs Weaver would straighten the intake port extensions from the curved layout he's shown, taking advantage of the one-inch offset between the cylinder banks.

Would the engine run up in the 11,000 rpm region? The valve gear shouldn't mind, while the corrected piston speed at 10,400 rpm works out to 4500 feet per minute — high but still compatible with an all-racing bottom end like this one.

Inboard drum brakes from back end of C6R Cunningham show center-plane shoe mounting later used by Chrysler. Layout is two-leading-shoe type.

The crank is carried in four mains; two plain bearings at the center, the rear one taking thrust, and roller bearings at the front and rear. Beautifully short, at 4½ inches center-to-center, the connecting rods have one-piece big ends to take roller bearings, made possible by the use of the Hirth system for assembling the seven-piece crank.

Low-pressure oil for all the big-end rollers is supplied from the two plain main bearings, through metering screws of the loose-thread type and chambers in the Hirth joining bolts. Twin gear-type pumps at the front of the engine supply pressure oil and scavenge the sump. Layout of the water pump and its supply piping is clear. No ignition system is indicated, but a suitable bevel drive from the cam gear towers is shown.

Hirth-type radial serrations join the crankshaft and the slim flywheel, which is mated with a two-plate edition of Borg and Beck's three-plate 7½-inch competition clutch. More radial serrations join the clutch shaft to the all-indirect transmission, which provides five forward speeds in the least space possible — without going to a Lotus-type progressive shift, that is. Ratios are selected by sliding the gears themselves into engagement with stationary dogs on the upper or output shaft, instead of sliding the dogs to engage the gears, as is usually done.

This general technique was used in the Auto Union gearbox of 1934 through 1939, unbeknownst to Mr. Weaver, who has carried the idea a step further by sliding complete pairs of gears, by means of large shifting yokes with double jaws, instead of sliding the selecting gears only. Briggs Weaver admits this appeals mainly to his sense of symmetry, and that the latter would be just as good.

Once engaged, an unusual cam-type shift mechanism will absolutely keep the gears from jumping out. At the bottom of the box is a finned sump and a gear-type pressure pump to circulate the lubricant. Magnesium could be used for the various box castings, but Mr. Weaver feels aluminum would probably suffice in view of the 990-pound minimum weight. Hypoid gearing lowers the engine ⅞ inch from the output shafts, in addition to the 2⅜-inch center-to-center distance of the gearbox, and drives through a ZF differential. The tubular axle shafts have Hooke-type universal joints at their inner ends and simple sliding pot-type joints out at the hubs.

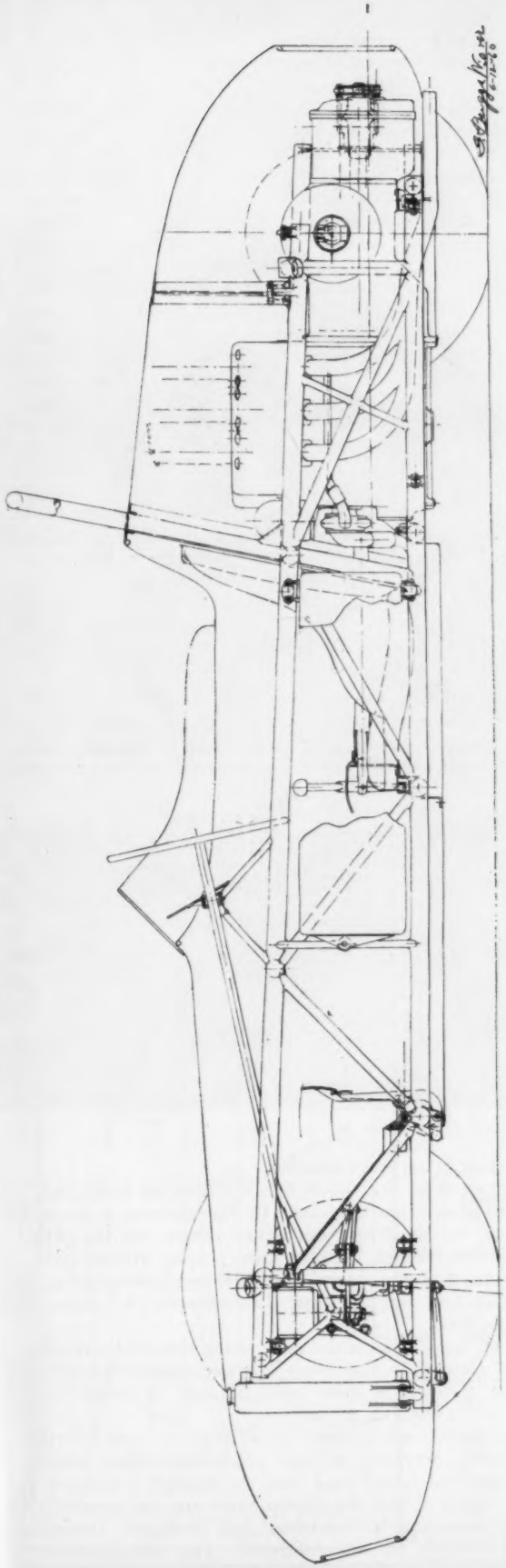
The Weaver 1500 is bound together by a straightforward truss-type tubular frame based on 1½-inch tubes laced together with 1¼-inch crossmembers and ¾-inch minor tubes. The drawings call for fine, unusual detailing, which recalls the C5R and C6R Cunninghams, and the resulting frame is likely to be far lighter than it looks, as was the case with the superb C6R chassis. Wherever mounts are called for, Weaver has used Lord rubber bushings, which he regards as an indispensable design element.

Another of Briggs Weaver's favorites is the Heim ball joint, which is found throughout the 1500's suspension and steering. Big Heim joints serve as steering-suspension ball joints in the front end, the bottom one taking all the spring loading axially rather than radially — an application well within its catalogued capabilities. The simple front wishbones are fabricated of tubing, their effective lengths being: top — 7 inches, bottom — 10 inches. A central steering box actuates an idler-arm linkage which uses long track rods to induce an understeering effect when the suspension's deflected.

At the rear, all brake torques and drive forces are transmitted by the broad-based bottom wishbone, leaving just a single tube at the top to provide parallel action. Naturally throughout the whole suspension system the Heim joints allow practically unlimited adjustment of critical angles. At all four corners Monroe coil/shock units are employed, right out of the catalogue, and wire wheels are also found at the extremities.

The drum brakes are very similar to those on the C6R Cunningham, which is to say that they resemble the Chrysler Center-Plane layout, since the latter was derived from the former after Chrysler engineering consultants saw it on Briggs Weaver's drawing board in 1954. The layout is two-leading-shoe, of course, with automatic adjusters, within 11-inch drums. These drums would have heat-treated aluminum faces, drilled for cooling and flexibility, riveted to high-grade cast iron braking surfaces, again as on the C6R. If weight were a problem, Weaver might use A1-Fin-bonded bimetallic braking surfaces.

Many other subtleties of the Weaver 1500 demand attention. A Heim joint is used on the steering column to provide a universal bearing. The throttle pedal is placed centrally, as Phil Walters perferred it on the Cunninghams. The shift linkage is such that a simple H pattern suffices for five forward speeds. All the suspension angles are beautifully integrated with the basic angles of the main frame tubes. All in all the Weaver 1500 is a magnificently complete racing car concept — complete, that is, except for the body, which we're leaving up to you!



CONTEST:

DESIGN A BODY FOR THE WEAVER 1500!

BRIGGS WEAVER DESIGNED THE CHASSIS; NOW IT'S UP TO YOU TO CREATE A BODY SHAPE FOR THIS 1961 GRAND PRIX CAR!

YOU MUST:

Use the side silhouette drawing at the left as the basis for at least one of your drawings, either by copying it same-size or making a tracing directly from it. You're welcome to submit as many other drawings as you like, but keep in mind we only need enough to understand the shape and purpose of your body design. You may find it helpful, for example, to make a tracing over the perspective drawing of the chassis on pages 78-79.

Please also include a brief written discussion of the features of your design.

YOU MAY:

Change the position and/or design of the water radiator, fuel tanks, and steering wheel, if the function of your body design requires it. You may also alter the shape of the rollover bar, if necessary, but not its height. Remember that the body shape indicated at left and on the perspective drawing is only a suggestion by Mr. Weaver, and needn't affect your body shape at all.

WE WILL:

Judge the entries equally on their appearance, and on their function. We're looking for dramatic styling and aerodynamic ideas (hard to execute on a G.P. car, where enclosed wheels are not allowed), and for clever, astute solution of problems of ducting, cooling and weight distribution. The staff of CAR AND DRIVER will act as judges.

WHEN?

Your entry should be postmarked not later than midnight of May 20, 1961. That doesn't give you too much time, so you'd best give it some thought right now!

WHY?

See Living-Room Lime Rock, starting on page 62. Through the courtesy of Polk's Model-Craft Hobbies, here in New York, we're giving away three of the Grand Prix series of the exciting Scalextric model racing sets described there! All will be supplied complete with a Raceway Power Supply, not usually included with these sets. First three prizes are as follows:

First: G.P.3 Set, forming a figure-eight track; value $57.90

Second: G.P.2 Set, forming an oval track with chicane; value $52.90

Third: G.P.1 Set, forming a straightforward oval track; value $47.90

Each kit includes two racing cars, of course, one Vanwall and one Lotus. If you already have a Scalextric set, Polk's will be glad to send you a gift certificate so you can get some of their wild new accessories, like hay bales or a first-aid hut.

If you don't win one of these, you might still nail down one of the ten (10) one-year subscriptions to CAR AND DRIVER being offered for Honorable Mention. If you already have a subscription, we'll just add on a year. We expect, of course, to publish as many of the winning entries as space will permit.

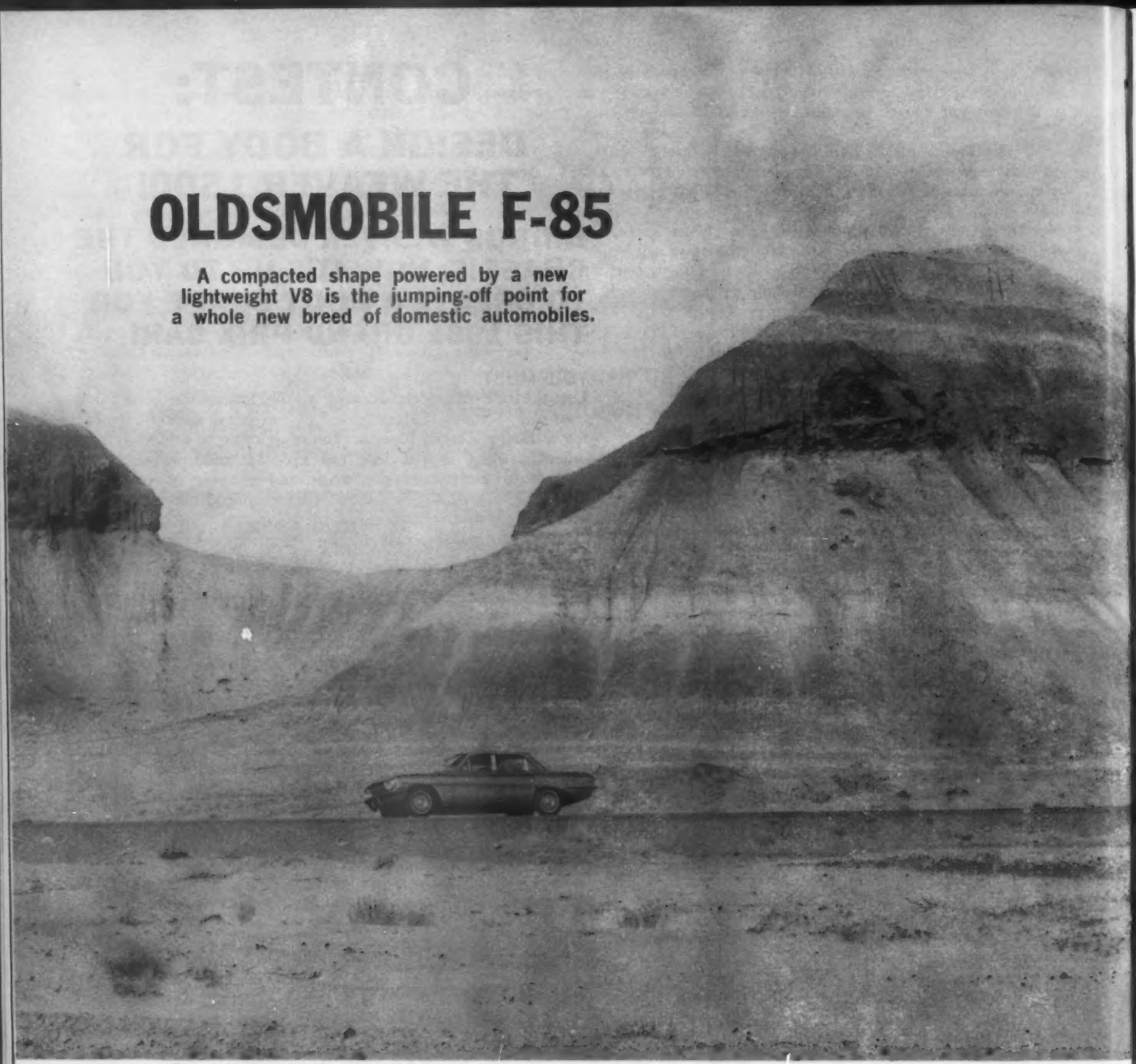
SEND YOUR ENTRY TO:

CAR AND DRIVER
Body Design Contest
One Park Avenue
New York 16, New York

HAPPY DESIGNING!

OLDSMOBILE F-85

A compacted shape powered by a new lightweight V8 is the jumping-off point for a whole new breed of domestic automobiles.



► It's no oversimplification to describe the F-85 as a conventional version of the Pontiac Tempest (and a not-quite-identical twin to the Buick Special). The bodies are so similar that even the doors are interchangeable. In contrast, the running gear is 100 percent different. A conventional rigid axle supplants Corvair-like swing axles, an aluminum V8 takes the place of the cast-iron four, a new miniaturized Hydra-Matic is mounted up front and even the front suspension is 100 percent different in detail if not in general. For a full description of the Tempest see SCI for October, 1960 and March, 1961. The Buick Special differs from the Olds only in transmission, cylinder heads, and pistons plus the obvious trim distinctions.

The Olds's interior is naturally very much like the Tempest's, being inside the same structure. The difference is that the Olds's traditional floor hump is quite small and never bothered us. Not because we're insensitive but because GM has gone to great lengths to shrink the Hydra-Matic that causes it; there is more room for the center occupant than in last year's full-sized cars.

Anyway, we think the virtues of a flat floor are over-rated in the case of six-passenger cars. Traveling six-up is never comfortable; the shoulder room is too narrow and the guy in the middle, caught between two people without the lateral support of the doors, has only those encroaching, swaying shoulders and the hope that wherever he's going, he'll soon be there.

Otherwise, the interior is the same as the already-described Tempest's. Getting in and out is easy and comfortable and the seating position is quite good though, as usual for American cars, a shade on the low side.

The instruments are clustered in a "floating" cowl above the dashboard. Servicing is made much easier than usual since all electrical connections come in through a nine-pin connector and if it and the speedo cable are disconnected, the entire cluster can be unfastened and lifted out. Instrumentation is simple but straightforward. The wide, pointer-type speedo with non-resettable odometer is flanked by

stylishly slender arrows for the turn indicators. On the right is a clock (optional, $16) and on the left a fuel gauge surmounted by the triple warning lights for "gen-temp-oil."

When you twist the key, you start up the sweetest, most promising engine C/D's ever seen come out of Detroit. About the same displacement as a Jaguar, the light V8 has all the silky smoothness that's traditional with domestic power plants. It idles at 500 to 550 rpm and with Hydra-Matic pulls smoothly at full throttle from that speed.

Since the behavior of the engine is determined in part by the characteristics of the automatic transmission coupled to it, a study of the latter is required.

Just as Oldsmobile is a trade name which encompasses several cars, so does Hydra-Matic refer to several transmissions. It's more complicated a matter than annual model changes because GM now makes three Hydra-Matics. The two new ones have three speeds forward while the older (and noticeably larger) one has four. The smaller three-speed is used in this country in only the F-85. This is rather surprising in view of GM's new habit of having several automotive homes for those basically identical items which are so costly to tool for. (Examples: the small B-O-P body shell, the Corvair-Tempest suspensions (front and rear) and also the F-85 Special suspensions.) The answer to this puzzle is that this same Type 61-05 Hydra-Matic is now optional (about $300) on the British Vauxhall Cresta and the German Opel Kapitän, both of about 2.6 liters. It may be offered soon on the 2.3-liter Australian Holden too. All of these are GM products, of course. Currently all Hydra-Matics are made here but if the foreign demand is sufficient, production may begin (*Continued on page 118*)

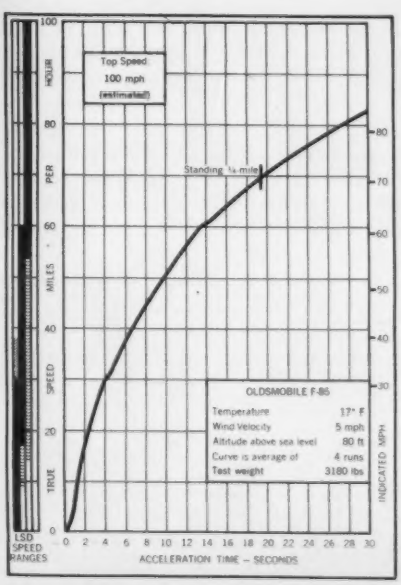
Aside from the ornate upholstery the interior of the Olds F-85 is a good example of the simple design theme of the new cars. New Hydra-Matic unit allows lower floor hump and more leg room for third person.

ROAD TEST:

OLDSMOBILE F-85

Price as tested: $2384 basic ($2519 deluxe)

Manufacturer: Oldsmobile Division
General Motors Corp.
Lansing, Michigan



ENGINE:

Displacement	215½ cu in, 3532 cc
Dimensions	Eight cyl, 3.50 in bore, 2.80 in stroke
Valve gear	Pushrod overhead valves, 1.6 to one rockers, hydraulic lifters.
Compression ratio	8.75 to one
Power (SAE)	155 bhp @ 4800 rpm
Torque	210 lb-ft @ 3200 rpm
Usable range of engine speeds	500-5000 rpm
Corrected piston speed @ 4800 rpm	2505 fpm
Fuel recommended	Regular
Mileage	13-20 mpg
Range on 16-gallon tank	210-320 miles

CHASSIS:

Wheelbase	112.0 in
Tread	56.0 in
Length	188.2 in
Ground clearance	4.9 in
Suspension	F, ind., coil, wishbones, anti-roll bar; R, rigid axle, four trailing arms, upperswept-in.
Turns, lock to lock	4.2
Turning circle diameter between curbs	37 ft
Tire and rim size	6.50 x 13 (7.00 x 13 optional); 13 x 4½J.
Pressures recommended	22 psi
Brakes; type, swept area	9½ in drums, 224 sq in
Curb weight (full tank)	2910 lbs
Percentage on driving wheels	48%

DRIVE TRAIN:

Gear	Synchro?	Ratio	Step	Overall	Mph per 1000 rpm
	Auto	3.57 2.52		11.54 8.14	6.2–8.8
Low	Auto	3.64 3.03	92–130%	11.78 9.79	6.1–7.3
Super	Auto	1.58	58%	5.21	14.0
Drive	Auto	1.00		3.23	22.0
	No	3.49		10.74	6.7
	No	2.57	66%	7.90	9.0
	Yes	1.55	55%	4.77	15.0
	Yes	1.00		3.08	23.2

Final drive ratio: 3.23 to one automatic, 3.08 to one manual shift.

V6

by Roger Huntington

Singlehandedly, Italy's Vittorio Jano brought the dormant V6 layout to life and made it one of the world's most respected in Lancia and Ferrari cars. Here's how and why it happened, and what it may mean here.

► There is considerable evidence around today to support a prediction that the V6 cylinder layout will become increasingly popular in the automotive field in the next five years. Lancia started the ball rolling in 1950 with its radical V6 Aurelia model. This triggered a flurry of interest in Detroit, which blew hot and cold for a while as usual. But just recently this interest has matured to the road-test stage in several domestic passenger car engineering sections — and into a new line of V6 truck engines from G.M. Truck and Coach Division. Meanwhile Ferrari took up the layout for racing, with considerable success. All this would seem to leave us at a "crossroads" of some kind.

WHY A V6?

The whys behind the various V6 designs running today are pretty simple to figure. In the case of a passenger car engine the V6 layout gives probably the best compromise between engine smoothness, cost, bulk and weight. In other words most motorists (or at least American motorists) would apparently prefer a minimum of six cylinders in anything but a minimum-cost car, for reasons of smoothness. The most compact, lightest and cheapest way to fit six cylinders into the average engine compartment is in a V layout. It's as simple as that. The upright in-line and horizontally opposed layouts can't touch the V6 for compact size; the cost and weight factors are a little harder to figure but the V6 would certainly hold its own here with any other layout.

G.M. truck engineers were not thinking primarily about the above factors when they planned their new V6. They were after minimum tooling costs and maximum interchangeability of parts between several engines in a series. Result was one basic V6 design in three bore sizes (same stroke) and a V12 in the intermediate bore size. In all, 56 parts are interchangeable among all four engines — including rods, valve gear, bearings and cylinder heads — and all engines are machined on the same line, the V12 block requiring two passes of the tools instead of one. In this way G.M. gets a series of engines in sizes from 305 to 702 cubic inches that can be built on one block line with many interchangeable parts. In the face of bread-and-butter advantages like these, the more exotic consideration of engine size doesn't seem very important.

RACING ADVANTAGES

It's a different story in racing. Here the V6 layout has definite functional advantages. It's pretty well agreed now that, given a fixed displacement (which is the case in most racing classes these days), the engine with the largest *piston area* will have the highest horsepower potential. This, of course, means shorter strokes, which, within a given limit on piston speed, gives us the highest usable rpm and, to keep same bore/stroke ratios, more cylinders. On the other hand, many cylinders generally mean more weight, more cost, more complexity, less reliability. The V6 layout looks like an excellent compromise between piston area, weight and bulk. I have no accurate figures on engine dimensions for G.P. cars, but let's compare several recent Formula 1 2½-liter engines, including the Ferrari Dino V6, on a basis of piston area and weight. The rating ractor will be square inches of piston area per pound of dry weight:

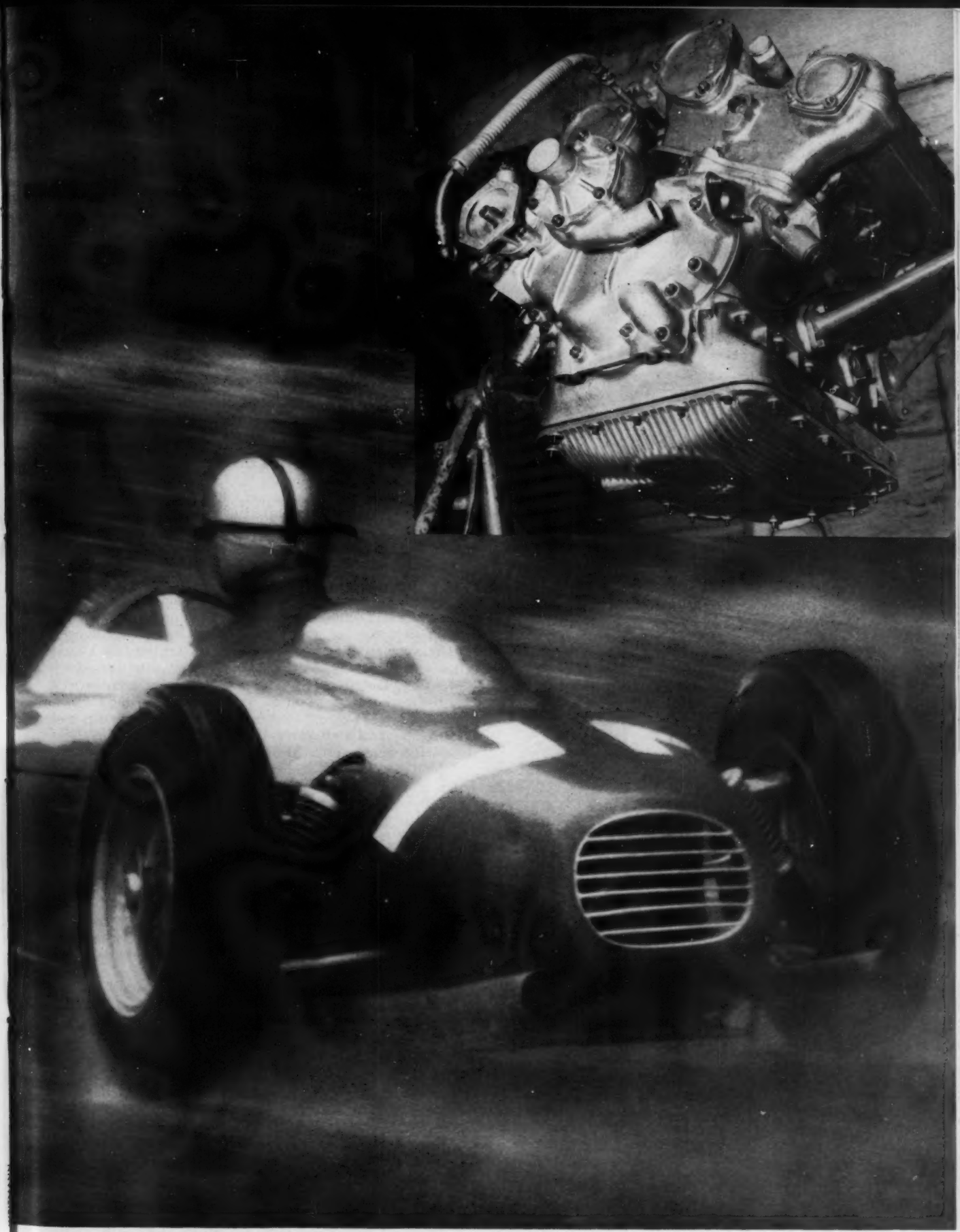
	dry weight, pounds	piston area, square inches	square inches per pound
Ferrari Dino V6	286	52.9	0.185
Coventry Climax V8	340	56.4	0.166
Lancia D50 V8	382	62.1	0.163
Coventry Climax 4	290	43.0	0.148
Ferrari Squalo 4	352	48.8	0.139
Maserati 250F 6	373	51.6	0.138
Scarab 4	350	44.1	0.126

All of these are 2½-liter engines, yet the weight of the V6 is by far the least, indicating it is also the least bulky. And on our basis of *piston area* per pound the V6 scores again.

HOW IT ALL HAPPENED

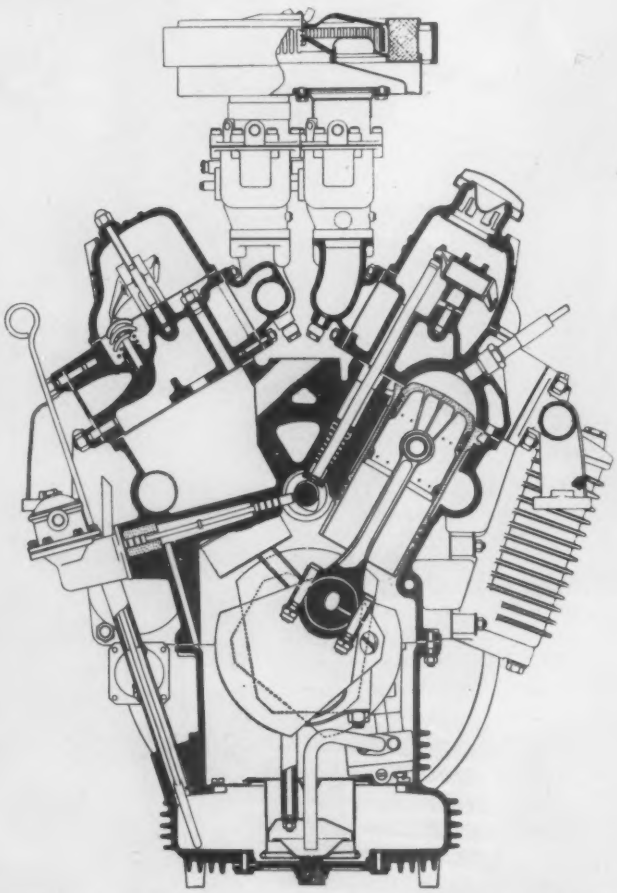
They say there's nothing new under the sun, and this has

(*Continued overleaf*)



In the bustle of this departing Ferrari is a 1½-liter V6, akin to the 2½-liter unit above. It will figure strongly in Grand Prix racing this year.

always been very true in the automotive field. Most of the seemingly recent technical developments like supercharging, disc brakes, fluid-drive transmissions, air suspension, fuel injection, etc. had their beginnings 40 to 60 years ago. The V6 cylinder layout seems to be an exception. I can find no record of any extensive development work anywhere in the world on the V6 layout prior to the Lancia activity in the late '40s, culminating in the introduction of the Aurelia at the Turin Automobile Show in May, 1950. (I know some of you historians will make a fool of me, but there it is!) Apparently the theoretical balance problems scared off the innovators. I know most of the classic engine-design textbooks touch on the layout, but none are encouraging. And generally a 120° V angle was held



Lancia's V6 has won wide and just acclaim. Version here is hopped-up mildly for use in one of the late G.T. Aurelias; Flaminia is similar.

to be more desirable than 60° — which, of course, would kill much of the advantage on size. Perhaps these are the reasons why the layout never caught on in the first 50 years of the high-output internal combustion engine.

We must credit the brilliant Italian engineer, Vittorio Jano, with bringing the V6 layout forward to a workable proposition. Prior to joining the Lancia organization in 1938, he had a 20-year background with Alfa-Romeo, designing everything from passenger car suspensions to all-out Grand Prix engines. He was the design impetus behind all the famous Alfa sports and racing engines of the '20s and '30s. He was — and still is — one of the vanishing breed who can take a clean sheet of paper and design an engine single-handedly. It took the all-around design genius of Jano and the progressive policies of Giovanni Lancia to put the V6 idea into hardware and then into production.

No accurate history can be traced of V6 evolution in this country because of the great secrecy surrounding such developments in the various company research departments. There is no doubt that the central research groups of all the Big Three did considerable work in the '50-55 period and the rumor mill was ringing about a V6 project at Kaiser-Frazer in 1954. Not much is known about these early designs except that most of them incorporated an auxiliary balance shaft rotating at twice crankshaft speed. We'll be investigating this balance problem below; suffice it to say here that the subject used to be of much more concern than it is today. It seems that the V6 idea could never get on its feet until the designers were able to *ignore* the theoretical balance problem!

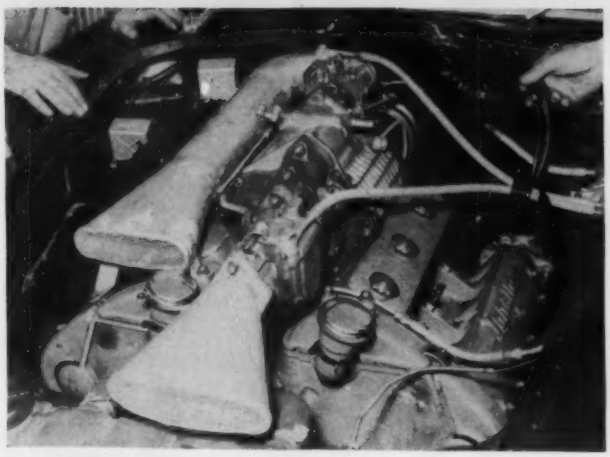
LANCIA AND FERRARI

Meanwhile the Lancia-Jano combo was moving forward. The original Aurelia V6 engine had 107 cubic inches and developed 56 bhp at 4000 rpm. Within a couple of years this had been pushed up to 118 bhp at 5000 from 150 cubic inches in G.T. form. In 1953 Lancia got into sports car racing with both feet. A new V6 engine was designed with special double-overhead-cam cylinder heads with dual ignition, and was used in displacements from 2.6 to 3.3 liters. A 2.6 version was used in the '53 Le Mans race with a belt-driven Roots-type supercharger. These racing engines developed upwards of 200 bhp at 6500 rpm. Big achievement for the year was an outright win in the Mexican road race, with Fangio up.

The next logical step was a try at Formula 1 racing. By early 1954 Jano was ready with a brand-new 2½-liter single-seater with a beautiful little V8 engine under the bonnet. He threw everything he knew into this one, including another extension of the piston area-vs.-horsepower theory After some teething troubles the first year, the D50 Lancia got rolling in '55, only to run head-on into the W196 Mercedes. Unfortunately Lancia wasn't doing even as well in the market place as on the racetrack, and in the summer of '55 they were forced to give up racing. The D50 cars and all components and spares — plus the services of Ing. Jano himself — were transferred to Ferrari.

By 1957 it was becoming obvious that the V8 Lancia design had reached the end of its useful life, as it was considerably heavier than the small four-cylinders and the fours were fast approaching it in power output. This was the signal for Jano to get to work on his real masterpiece — the Ferrari Dino 246. His experience with the D50 suggested that another V8 wouldn't be a good investment, yet he wanted to retain a definite piston area advantage over the four's. The V6 layout was the logical choice — and Jano's experience with it at Lancia had convinced him that it was capable of very high specific outputs and high rpm. The only important break with tradition was the selection of a V angle of 65° instead of the usual 60, to give more space for an induction system in the V. Otherwise the engine was quite straightforward (see the September, 1958 issue of SCI).

All of which brings us back to the latest V6 developments in Detroit. As mentioned, the G.M. V6 truck engine series probably does not owe its existence to any evolutionary thinking about the functional efficiency of the V6 layout. The choice was a matter of simple manufacturing economics. But you can be sure that the passenger car development going on in the back rooms of the various research centers is carefully weighing all the angles of the V6 theme. With the overall design trend now leaning toward smaller external dimensions, space is going to be an increasing problem at all points in the package. The engine length problem was one reason for going to the V8 layout in the early '50s; those problems are more acute now. The saving in width by going from a V angle of 90° to 60° will greatly ease space problems



MAILANDER

The missing link — Jano's four-cam V6 for sports-racing Lancias was an all-new design. Roots blower, shown here, was used only at Le Mans.

in the layout of the front suspension and framework.

A shorter, narrower engine of reasonable displacement and power might allow all kinds of oddball drive layouts. One of the most interesting engineering prototypes in the Motor City right now is a *front-drive* car with a small aluminum V6 engine mounted *transversely* in front of the firewall, driving by *chain* to an automatic fluid-drive transmission between the engine and the differential! This layout would have been impractical with a V8, yet it's smoother than a four. Within the compromise framework of maximum smoothness with minimum dimensions, weight and cost, the V6 layout looks like a logical next step.

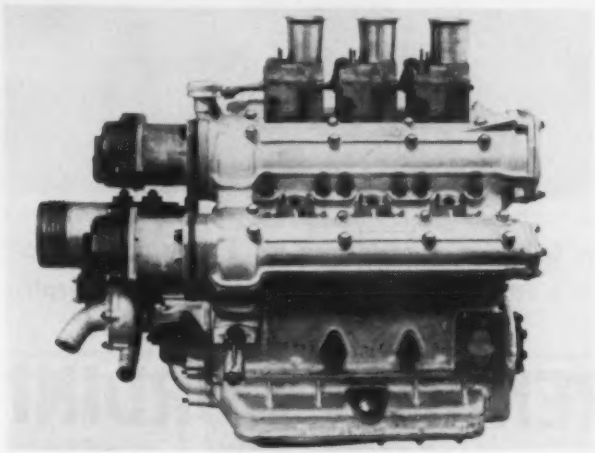
Few other significant details have leaked about current Detroit V6 prototype designs except that none are known to use the twice-crank-speed auxiliary balance shaft that was thought necessary in the early '50s. This is a story in itself . . .

THE BALANCE PROBLEM

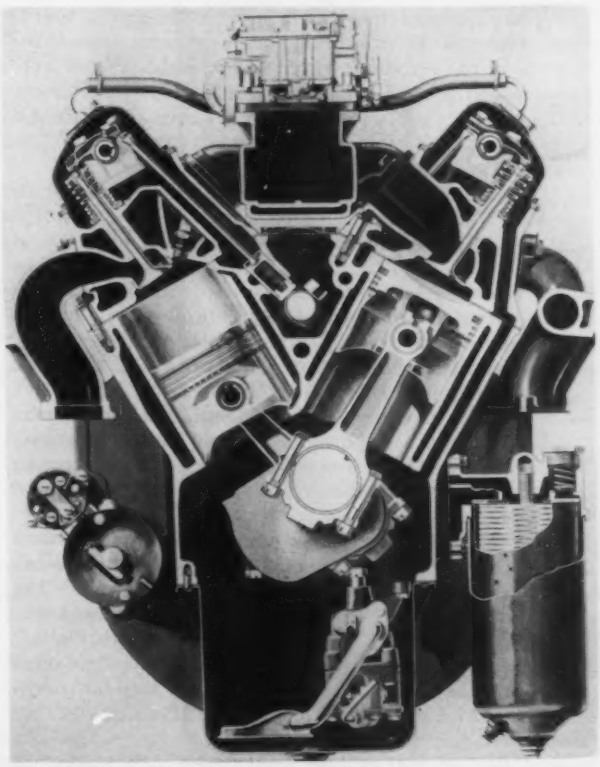
Whenever a body is accelerated or decelerated its mass generates an inertia force that acts opposite to the direction of acceleration (or *in* the direction of deceleration). Thus when the piston and the upper half of the rod (a rough but usable approximation) are stopped and started at the top and bottom of their stroke, we get a force that pulls *up* on the crankpin at the top of the stroke and *down* at bottom dead center. In a single-cylinder engine these "reciprocating inertia" forces will cause an up-and-down vibration. Furthermore, the lower end of the connecting rod, the crank arms and crankpin will generate *centrifugal* forces about the crankshaft axis that would normally cause a rotating unbalanced condition. Since these peak forces can amount to several thousand pounds at 4000 to 6000 rpm speeds (they increase as the *square* of the rpm) we obviously have very significant balance problems on any high-speed reciprocating engine.

Fortunately Mother Nature solves most of them for us. Of course simple centrifugal forces can be readily counterbalanced by putting a calculated mass on the opposite side of the crank axis. You can't completely counterbalance reciprocating inertia forces this way because their value varies in magnitude and direction over the stroke, being zero near mid-stroke. But in multi-cylinder engines there are several cases where the inertia forces in one cylinder will act exactly opposite to those in another, and the counterbalancing forces will be so distributed along the length of the crankshaft that there will be no unbalanced "couples" (torques) tending to rock the engine on its mounts. Examples of this condition would be the in-line six and eight-cylinder arrangement, V12, V16, and the opposed six like the Corvair. All these except the Corvair, however, still require crank counterweighting to balance centrifugal forces; the Corvair, by spacing adjacent crank throws in the three pairs 180° apart, gets the centrifugal force in one cylinder to balance that in the next — and thus gets a 6-throw crank that weighs only some 26 pounds! In a few layouts you can use a calculated mass added to the crank centrifugal counterweighting to balance all reciprocating inertia forces and rocking couples. These would include the usual vee-twin motorcycle engine (no rocking couple) and the popular V8 with the two-plane crankshaft.

The V6 is a little different problem. Here we have three pairs of crank throws spaced 120° apart, with the two in a pair spaced 60° — and with several possible arrangements of the pairs. In all cases with a 60° vee angle the reciprocating inertia forces are balanced. But (*Continued on page 113*)



The Grand Prix Ferrari V6 has been reworked for the 1961 rear-engined sports car, with distributors on left cylinder bank and a generator.



GM's use of the V6 pattern for its truck engines followed exhaustive tests, and may well foreshadow similar engines for U. S. passenger cars.

The Dauphine owner's plea for a little more power and a little more styling receive an emphatic reply.

RENAULT GORDINI

► Imported auto manufacturers, including Renault, are in what may euphemistically be described as a touchy position. Much like good old Ulysses, their United States sales boat is between the Scylla of the domestic compacts and the Charybdis of the recession. Faced with this dilemma of new, fierce competition and an industry-wide lack of customers, Renault, much like a prize fighter seeking to retain his crown, has not exhibited despair, but has concentrated on its footwork and developing a Sunday punch.

By "footwork" we mean that Renault has trimmed its prices and liberalized its new-car warranties. An example is its popular Dauphine model which recently had a total of $260 pared from its POE price, bringing it to $1385. The "Sunday punch" refers to the car we test here – the Renault Gordini. Priced at $1645, East Coast POE, it offers a margin of performance and styling extras similar to those of the deluxe Caravelle at exactly the old price for the stock Dauphine. It is not a "new car;" it does not replace the Dauphine. But for the performance-minded family man to whom economy is important, it would be worth investigating seriously and it's a noteworthy addition to the Renault line, plugging the gap between pure sedan and pure grand tourer.

Last fall at the Paris auto show, the star of the big Renault stand was the Renault Ondine. It was essentially a stock Dauphine, but with deluxe interior and exterior trim. The most obvious mark of recognition was nicely vented disc wheels. However it was also possible to order an Ondine Gordini, which featured the fancier interior plus the engine and 4-speed box used in the Caravelle. It's this car, introduced in the United States as the Renault Gordini, that we tested. The name "Gordini," by the way, no longer indicates The Sorcerer's original cylinder head design. When Renault decided to produce a hotter engine in quantity, they redesigned the Gordini top end beyond recognition, producing a unit that still performs very well and remains a stock item.

While it resembles its predecessor, the Gordini is not "just another Dauphine." Not that that would be so bad, but the car has an entirely different feel, look and action from the standard car. The one we tested started quickly on the twist-key ignition switch. It idled at a fast rate on the foolproof automatic choke and could be driven off at near-freezing temperatures even before the needle left the "cold" peg. Warming quickly to its work, it offered much-improved performance over the standard car. As on the Caravelle, cool air for the carburetor is fed through a car-long pipe starting at a screened opening in the spare tire compartment.

The Gordini's handsome interior is matched by increased power, four-speed transmission and deluxe outside trim.

The four-speed transmission (unfortunately *sans* synchromesh on first) worked smoothly no matter how fast the shift. However, really fast shifts were hard to come by for two reasons. First of all, with the seat in the full rearward position, the spindly lever was out of reach without leaning forward when placed in first or third. Secondly, it has a very sloppy feel, a complaint we had about the Caravelle too. It's indefinite in its H-pattern and there seems to be a lot of play in the linkage. In addition, the throw from neutral to, say, first is longer than from neutral to second. If the first and third throws were as short as those to second and fourth, it would be a great improvement, but the inherent vagueness remains very undesirable.

From rest the car accelerates briskly, the audible exhaust note changing from a pleasant burble to an enjoyable near-roar. If you wind too high when popping the clutch, there is a moment of hesitation and it feels as if the whole power train is rotating under the torque forces. Using the right amount of revs, the power comes on smoothly. This feeling

of tightening up seems to appear only in first. From there on up you can floor it – and get results. With a little dexterity, heel and toe pedal work can be accomplished; just watch out for the steering column and the heater. The accelerator has a smooth progressive action, nice in traffic and fine for feathering in corners. The clutch has light pressure, but we found no indications of slippage. The brakes required rather high pedal pressures but without too much work could lock all four wheels. In such panic stops the car remained stable, dipping its nose slightly but not slewing in any way.

Cruising at 65 seems about the top limit from a point of view of driver comfort on a turnpike. Though there is a power reserve, considerable engine and wind noise is generated as the Gordini thrusts ahead. It's on secondary roads that the car comes into its own. High terminal speeds may not be the Gordini's forte (though they are higher than the Dauphine's) but respectably high *averages* are well within its capabilities. Such averages are the direct result of the higher performance of the engine coupled with the fine touring suspension of the Dauphine. Through judicious wheel and throttle work, the Gordini can be flung with near abandon through chicanes.

The trim has been extensively improved. That applied outside is done tastefully (if you have no reservations about "gold" lettering) and that on the inside is equally restrained. The dashboard has a handsome functional black crackle finish that reflects no light on the curved windshield. This eliminated one complaint we had about the Caravelle, which had a dark but shiny dash. The instruments (speedometer, odometer without tenths, fuel and temperature gauges and oil and ignition lights) are housed in a hooded nacelle. The lower edge of the dashboard has a strip of resilient material and there are two cubby holes (plus pockets in the front doors).

A Caravelle two-tone steering wheel sets the color key for the driving compartment. Ours was in various hues of brown and tan, some tending toward a pinkish shade. A thoughtful feature was the installation of two ashtrays on the center posts for rear passengers' use. Visibility is good all around, although we personally would have preferred the driver's seat to be about an inch lower to allow better rearward vision when using the mirror. The seats, with adjustable rake for the front ones, are covered in a durable-looking washable leatherette.

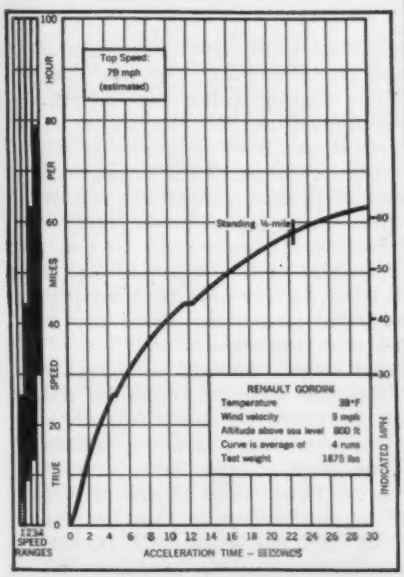
In 1961, Renault is seeking to retain a high niche in United States imported car sales. The introduction of the Gordini – at the price one formerly paid for the lower-powered, starker Dauphine – is one effort in that direction. For the enthusiast, the Gordini offers a convenient way to get "a little more power" and "a little more class" without fracturing the family budget and without the worry that no one but the owner can tune the car or that spare parts might be unattainable. Renault's vast dealer network should assure driving peace of mind from coast to coast. And if you and your family are going to drive coast to coast in a Renault, the Gordini's the logical choice. Its performance and economy should turn the drive into a milk run. *C/D*

ROAD TEST

RENAULT GORDINI

Price as tested: $1645 East Coast POE
$1659 Gulf Coast POE
$1755 West Coast POE

Importer: Renault, Inc.
750 Third Avenue
New York 17, New York



ENGINE:

Displacement	51.5 cu in, 845 cc
Dimensions	Four cyl, 2.28 in bore, 3.15 in stroke
Valve gear	Pushrod overhead valves, vertical in-line
Compression ratio	8.0 to one
Power (SAE)	40 bhp @ 5000 rpm
Torque	48 lb-ft @ 3300 rpm
Usable range of engine speeds	1200-5900
Corrected piston speed @ 5000 rpm	2240 fpm
Fuel recommended	Regular
Mileage	35 mpg
Range on 8.5 gallon tank	300 miles

CHASSIS:

Wheelbase	89.4 in
Tread	F 49.2, R 48.0 in
Length	155.2 in
Ground clearance	5.97 in
Suspension: F, ind., wishbones, coil and air bag; R, ind., swing axle, coil and air bag.	
Turns, lock to lock	4.6
Turning circle diameter between curbs	30½ ft
Tire and rim size	5.50 x 15, 15 x 4J
Pressure recommended	F 15, R 23 psi
Brakes: type, swept area	9 in drums, 158 sq in
Curb Weight (full tank)	1600 lbs
Percentage on driving wheels	58½%

DRIVE TRAIN:

Gear	Synchro?	Ratio	Step	Overall	Mph per 1000 rpm
Rev	No	3.70		16.2	—4.3
1st	No	3.70	——	16.2	4.3
2nd	Yes	2.10	76%	9.18	7.5
3rd	Yes	1.46	44%	6.38	10.8
4th	Yes	1.03	42%	4.50	15.3

Final Drive Ratio: 4.37 to one.

TEUTONIC T-BIRD

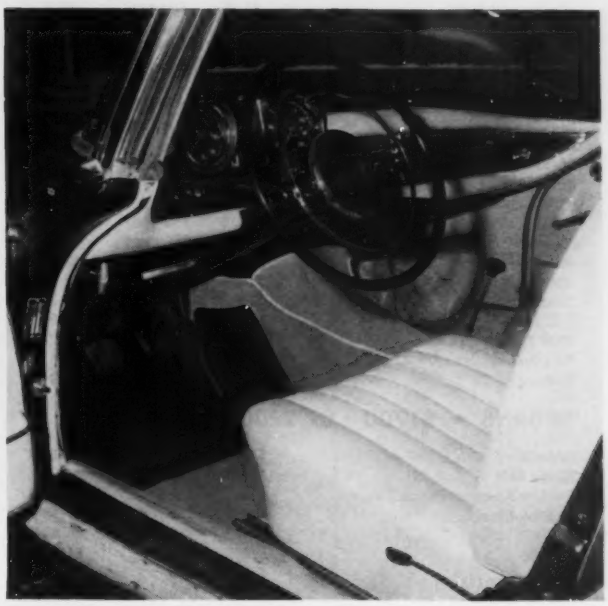
► Perhaps it isn't exactly sacrilege to park the latest Mercedes 220SE coupe in the same garage as the Thunderbird. It certainly is that kind of car: a special sports-type, limited-production prestige vehicle offering just a bit more than is found on the less-expensive sedan from which it is derived.

The new Mercedes differs from the 220SE sedan in a few notable ways. The sedan body/chassis has been strengthened after extensive tests to obtain the same amount of structural rigidity with this two-door hard-top. A subtle restyle at the rear easily distinguishes the new coupe from its sedan cousin. Wheelbase and overall length are the same but if you find yourself stooping a bit more getting in, it's because the Sindelfingen stylists have managed to lower the car by two inches. Its curb weight is some 135 pounds heavier than the sedan, due to the additional body steel, but underneath the rigid body/chassis unit is the same layout as the 220SE sedan with some significant additions.

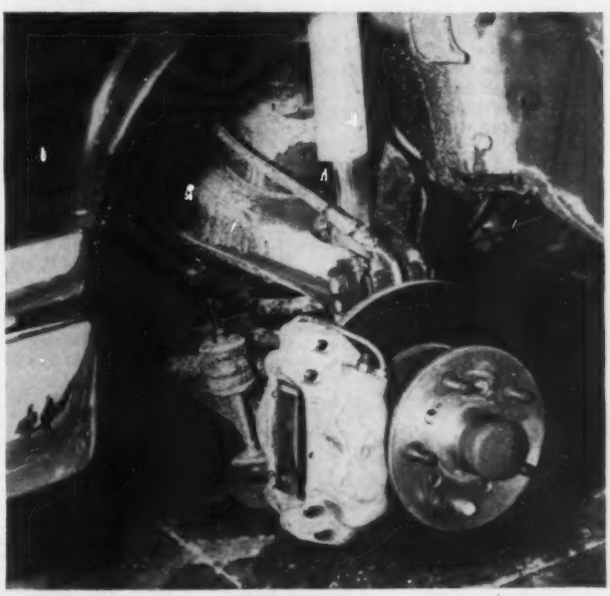
This is the first production Mercedes passenger car with disc brakes. Ate-servo-assisted, English-made Girling discs have been fitted at the front, while the traditional cast-iron finned drums are retained at the rear. The vertical speedometer of the sedan has been supplanted by an oval speedo and tach, both mounted in the traditional "SL" fashion directly behind the steering wheel. The addition of a stick shift will no doubt be welcomed by all 220SE owners, who will immediately want this layout on their own cars. The importance of a stick shift is amazing in this day and age, and that one item will probably sell the new Mercedes more than any other single thing, if they have to be *sold* at all. I predict that this car will enjoy unparalleled success and that Sindelfingen won't be able to make enough of them. If and when the 3-liter direct-fuel-injection power unit is made available, happy owners of this special Mercedes will find themselves behind the wheel of as potent and safe a motor car as can be built today for any price. But the performance of the 2-liter engine is considerably more than is to be expected from such a small-displacement unit.

This 134-bhp fuel-injected six-cylinder will be the only power unit available in the new Mercedes coupe for the moment. The latest Bosch injection equipment features a dual-plunger-type pump while the latest metering devices sort out all exterior variations, such as atmospheric pressure and temperature, to deliver exactly the right amount of fuel at the precise moment to all six combustion chambers. As we noted in our road test of the 220SE sedan (SCI, December, 1959), the flexibility and amazing torque of this engine have to be sampled to be properly appreciated. As one journalist remarked, "its top-gear performance makes a

Cheek by jowl with Jesse Alexander's very special low-pivot 300SL, the lowness of Mercedes's new coupe is emphasized. Makes a nice stable!



Coupe instrument panel differs from sedan's in having circular speedometer and tach. Other notable difference is floor-mounted stick shift.



The 220SE Coupe is fitted with Girling discs on the front wheels, and sedan drums on the rear. It is the first production Merc to use discs.

This 220SE Coupe will undoubtedly become the transport for people who have arrived. It offers just a little bit more than the already socially acceptable sedan from which it was developed.

mockery of automatic transmissions." Fuel consumption figures are markedly superior to those obtained on the dual-carburetor "S" engine.

I recently tried to follow a new 220SE coupe on a winding, snow- and slush-covered road near the Stuttgart factory. With my 300SL I couldn't keep up with the fast-disappearing car ahead, and this is the significant point about the 220SE chassis. For such a big automobile it has fantastically safe road manners. The elimination of final oversteer by Uhlenhaut's engineers is the greatest single step toward giving the car its unique feeling. The speeds at which the 220SE can be driven over winding, badly-surfaced roads are really impressive. This fact, with the ample pulling power of the 134-cubic-inch engine, is the answer to its success in the 1960 European Touring Championship.

Our Teutonic Thunderbird is a very luxurious car, and its interiors are the best that Daimler-Benz craftsmen can produce. Top-quality leather covers the four individual bucket-type seats. Exotic wood veneer covers the dashboard. Later in the year a convertible coupe will also be available, but a limited production run will keep the prices of both cars high, so if you want to become a member of this exclusive owner's club, you'd better get in line now.

—Jesse Alexander

BUYER'S GUIDE

In this listing of over 200 different automobiles there is bound to be one to suit your performance requirements — if not your budget. Prices range from $1065 to $26,320, while top speeds go from 55 mph to 180 plus. Seating capacity runs the gamut from a cozy two to a bus-like ten. Engine types span the design spectrum from two-cylinder two-cycle power

Make and Model	Price	Number of Cylinders	Displacement (Cubic Inches)	Bore and Stroke	Compression Ratio	BHP @ RPM	Speeds Forward	Top Ratio	Wheelbase	Seating	Dry Weight
SEDANS • UP TO $1400											
Goggomobil T 400	$1065	Flat-twin	23.9	2.64 x 2.20	6.0	22 @ 5000	4	4.79	71	4	895
Vespa 400	$1080	Two	24.0	2.48 x 2.48	6.8	14 @ 4350	3	4.41	66.5	2	792
Renault 4CV	$1095	Four	45.6	2.28 x 3.15	7.8	28 @ 4500	3	4.5	82.8	4	1322
Fiat 500 D	$1098	Two	30.5	2.65 x 2.76	7.1	22 @ 4400	4	5.12	72.4	4	1070
Austin & Morris 850	$1295	Four	51.8	2.48 x 2.69	8.3	37 @ 5500	4	3.77	80	4	1330
Citroen 2CV	$1295	Flat-twin	25.9	2.60 x 2.44	7.0	12 @ 3500	4	5.72	93	4	1078
Renault Dauphine	$1385	Four	51.5	2.28 x 3.15	8.0	32 @ 4250	3	4.53	89	4	1397
Goggomobil T 700	$1386	Flat-twin	42.0	3.07 x 2.83	7.2	33 @ 4900	4	4.86	78.7	4	1320
Daf 600	$1395	Flat-twin	36.0	2.99 x 2.56	7.0	22 @ 4000	∞	4.40	81	4	1268
Fiat 600 D	$1398	Four	46.8	2.44 x 2.50	7.5	32 @ 4800	4	4.82	78.8	4	1279
NSU Prinz	$1398	Two	35.6	2.95 x 2.60	6.8	26 @ 4800	4	4.78	78.8	4	1106
SEDANS • $1400 to $1700											
Morris Minor 1000	$1495	Four	57.9	2.48 x 3.00	8.3	37 @ 4800	4	4.55	86	4	1630
Volkswagen	$1565	Flat-four	72.7	3.03 x 2.52	7.0	40 @ 3900	4	3.88	94.5	4	1600
Hillman Minx Special	$1599	Four	91.2	3.11 x 3.00	8.5	56.5 @ 4600	4[1]	4.55	96	4	2110
Ford Anglia 105E	$1608	Four	60.8	3.19 x 1.91	8.9	41 @ 5000	4	4.13	90.5	4	1630
Datsun Bluebird	$1616	Four	72.5	2.88 x 2.80	7.5	48 @ 4800	3	4.63	89.8	4	1900
Toyopet Tiara	$1638	Four	88.7	3.03 x 3.07	8.4	75 @ 5000	3	4.38	94.5	4	2100
Renault Gordini	$1645	Four	51.5	2.28 x 3.15	8.0	40 @ 5000	4	4.50	89	4	1397
BMW 700	$1648	Flat-twin	42.5	3.07 x 2.87	7.5	35 @ 5200	4	5.43	83.5	4	1410
Simca Aronde	$1658	Four	78.7	2.91 x 2.95	7.2	52 @ 4800	4	4.44	96.2	5	1970
Fiat 1100	$1659	Four	66.5	2.68 x 2.95	7.85	55 @ 5200	4	4.30	92.1	4	1940
DKW 750	$1665	Three	45.2	2.68 x 2.68	8.0	39 @ 4400	4	3.88	85.6	4	1495
Ford Prefect	$1686	Four	60.8	3.19 x 1.91	8.9	41 @ 5000	4	4.43	87	4	1720
Panhard PL-17	$1697	Flat-twin	51.9	3.35 x 2.95	7.25	50 @ 5300	4	4.71	101	6	1770
SEDANS • $1700 to $2000											
Arabella	$1745	Flat-four	54.8	2.72 x 2.36	7.5	44 @ 4800	4	4.21	86.6	4	1625
Austin A40	$1795	Four	57.9	2.48 x 3.00	8.3	38.5 @ 5000	4	4.50	83.5	4	1610
Rambler American Deluxe 2-door	$1845	Six	196	3.11 x 4.24	8.0	90 @ 3800	3[1]	3.78	100	5	3632
Triumph Herald	$1849	Four	57.9	2.48 x 2.99	8.0	40 @ 4500	4	4.88	91.5	4	1707
Hansa	$1883	Flat-four	66.5	2.91 x 2.52	7.5	46 @ 4250	4	4.00	89.3	4	1900
Saab 96	$1895	Three	51.3	2.76 x 2.87	7.3	42 @ 5000	3	5.23	98	4	1708
Volvo	$1895	Four	96.4	3.13 x 3.15	7.5	60 @ 4500	3	4.56	102.5	5	2112
Simca Elysee	$1898	Four	78.7	2.91 x 2.95	7.2	50 @ 4800	4	4.44	96.3	5	1980
Ford Falcon 2-door	$1912	Six	144	3.50 x 2.50	8.7	85 @ 4200	3[1]	3.10	109.5	6	2280
Chevrolet Corvair Series 500 Coupe	$1920	Flat-six	145	3.44 x 2.60	8.0	80 @ 4400[2]	3[1,14]	3.27	108	6	2360
Rambler American Super 2-door	$1930	Six	196	3.11 x 4.24	8.7	127 @ 3800	3	4.38	108	5	2800
Studebaker Lark Deluxe Six 2-door	$1935	Six[4]	170	3.00 x 4.00	8.5	112 @ 4500	3[1]	3.73	108.5	6	2620
Plymouth Valiant V-100 2-door	$1953	Six	170[5]	3.40 x 3.13	8.2	101 @ 4400[3]	3[1]	3.55	106.5	6	2688
Vauxhall Victor Super	$1958	Four	92.0	3.13 x 3.00	7.8	54.8 @ 4200	3	4.62	98	5	2140
Dodge Lancer Series 170 2-door	$1979	Six	170[5]	3.40 x 3.13	8.2	101 @ 4400[8]	3[1]	3.55	106.4	6	2688
Opel Olympia Rekord	$1988	Four	102.8	3.35 x 2.91	7.8	64 @ 4200	3	3.90	100	5	1967
Auto Union 1000	$1995	Three	59.8	2.91 x 2.99	7.25	44 @ 4500	4	4.71	95.5	5	1995
Comet 2-door	$1998	Six	144[6]	3.50 x 2.50	8.7	85 @ 4200[7]	3[1]	3.10	109.5	6	2280
Fiat 1100	$1998	Four	74.5	2.83 x 2.95	8.25	55 @ 5300	4	4.30	92.1	4	1972
SEDANS • $2000 to $2300											
Ford Consul	$2059	Four	103.8	3.25 x 3.15	7.8	61 @ 4400	3	4.11	104.5	5	2408
Simca Grand Large	$2071	Four	77.4	2.91 x 2.95	7.9	57 @ 5200	4	4.44	96.3	5	1908
Singer Gazelle	$2095	Four	91.2	3.11 x 3.00	8.5	60 @ 4500	4	4.44	96.0	5	2226
Volvo PV 544	$2125	Four	96.4	3.13 x 3.15	8.2	85 @ 5500	4	4.10	102.5	5	2130
Pontiac Tempest	$2167	Four[4]	194.5[8]	4.06 x 3.75	8.6	110 @ 3800[9]	3[1]	3.55	112	6	2912
Austin A 55	$2198	Four	90.9	2.88 x 3.50	8.3	55 @ 4350	4	4.55	99	5	2296
Ford Zephyr	$2240	Six	156	3.26 x 3.15	7.8	90 @ 4500	3	3.90	107	4	2576
Peugeot 403	$2250	Four	89.6	3.15 x 2.87	7.5	66 @ 4750	4	4.31	105	6	2200
Morris Oxford	$2259	Four	90.9	2.88 x 3.50	8.3	55 @ 4350	4	4.55	99	5	2339
Prince Skyline	$2250	Four	90.6	3.31 x 3.31	8.5	90 @ 4800	4	4.63	99.8	6	2860
SEDANS • $2300 to $3000											
Buick Special Standard	$2384	Vee-eight	215	3.50 x 2.80	8.75	155 @ 4600	3[1]	3.36	112	5	2912
Oldsmobile F-85 Standard	$2384	Vee-eight	215	3.50 x 2.80	8.75	155 @ 4600	3[1]	3.23	112	5	2912
Lancia Appia	$2398	Vee-four	66.5	2.67 x 2.95	8.0	53 @ 4900	4	4.18	98.8	4	2016

1 Automatic optional
2 98 @ 4600 optional
3 145 @ 5200 optional
4 Vee-eight optional
5 225 optional
6 170 optional
7 101 @ 4400 optional
8 215 optional
9 155 @ 4600 optional
10 80 @ 6500 optional
11 102 @ 7000 optional
12 125 @ 6000 optional
13 Three-speed optional
14 Four-speed optional

plants to horrendous V12s. The smallest engine's displacement in this Guide is 23.9 cubic inches — or roughly the contents of a Coke bottle — while the largest's is 430 cubic inches — about like an overflowing jeroboam. Horsepower — that statistic loved by the "wottle she do?" brigade — starts at 21 bhp and scrambles up to a spine-tingling 500. These are some of the boundary lines of today's automobile market. Chart them all in these four pages, make your choice, then go shopping for the best possible deal. Without a doubt this is a vintage year for the well-informed buyer and, we hope, for the builders too.

Make and Model	Price	Number of Cylinders	Displacement (Cubic Inches)	Bore and Stroke	Compression Ratio	BHP @ RPM	Speeds Forward	Top Ratio	Wheelbase	Seating	Dry Weight
Ford Zodiac	$2412	Six	156	3.26 x 3.15	7.8	90 @ 4500	3	3.90	107	4	2576
Volvo 122S	$2495	Four	96.5	3.13 x 3.15	8.2	85 @ 5500	4	4.56	102.4	4	2352
Auto Union 1000S	$2526	Three	59.8	2.91 x 2.99	7.25	57 @ 4500	4	4.38	96.5	5	1995
Citroen ID 19 & Deluxe	$2545	Four	116.6	3.07 x 3.94	7.5	75 @ 4500	4	3.31	123	5	2475
Peugeot 404	$2575	Four	98.7	3.31 x 2.87	7.2	74 @ 5400	4	4.20	104.3	5	2244
Borgward Isabella TS	$2645	Four	91.1	2.95 x 1.93	8.2	82 @ 5200	4	3.90	102	4	2304
MG Magnette	$2695	Four	90.9	2.88 x 3.53	8.3	63.5 @ 5000	4	4.30	99	4	2422
Fiat 2100	$2798	Six	125.3	3.03 x 2.89	8.8	82 @ 5000	4	4.30	104.3	5	2552
SEDANS • $3000 to $4000											
Austin A99	$3095	Six	178	3.28 x 3.50	8.3	112 @ 4750	4	2.74	108	6	3200
Citroen DS 19	$3245	Four	116.6	3.07 x 3.94	7.5	75 @ 4500	4	3.30	123	5	2500
Mercedes-Benz 180	$3300	Four	115.7	3.34 x 3.29	7.0	78 @ 4500	4	3.90	104.3	5	2390
Mercedes-Benz 190	$3491	Four	115.7	3.34 x 3.29	8.5	90 @ 5000	4	4.10	104.3	5	2450
Mercedes-Benz 180D	$3577	Four	107.8	2.95 x 3.94	19.0	46 @ 3500	4	3.70	104.3	5	2510
Rover 80	$3645	Four	140	3.56 x 3.50	7.0	77 @ 4250	4	4.30	111	6	3100
Lancia Flavia	$3685	Flat-four	91.5	3.23 x 2.80	8.3	78 @ 5200	4	4.10	104.3	6	2690
Rover 100	$3695	Six	160	3.06 x 3.63	7.8	104 @ 4750	4	3.90	111	6	3120
Mercedes-Benz 190D	$3768	Four	115.7	3.34 x 3.29	21.0	55 @ 4000	4	3.70	104.3	5	2520
Grosse Borgward	$3950	Six	136.7	2.95 x 3.33	8.7	100 @ 5100	4	3.90	104.3	6	2800
Humber Super Snipe III	$3995	Six	180	3.44 x 3.25	8.0	130 @ 4800	3[1]	4.55	110	6	3250
SEDANS • $4000 and up											
Mercedes-Benz 220	$4333	Six	134	3.15 x 2.87	8.7	105 @ 5000	4	3.90	108.2	5	2570
Rover 3 Litre	$4620	Six	183	3.06 x 4.13	8.8	115 @ 4500	4[1]	3.90	92.5	6	3560
Mercedes-Benz 220S & SE	$4633	Six	134	3.15 x 2.87	8.7	124 @ 5000	4	4.10	108.2	5	2590
Jaguar 3.8	$4915	Six	231	3.43 x 4.17	9.0	225 @ 5500	4[1]	3.54	107.5	5	3210
Lancia Flaminia	$5998	Vee-six	150	3.15 x 3.21	7.9	112 @ 4800	4	3.92	113	5	3260
Jaguar Mark IX	$6020	Six	231	3.43 x 4.17	8.0	220 @ 5500	4[1]	4.27	120	6	3900
Lincoln Continental	$6067	Vee-eight	430	4.30 x 3.70	10.0	300 @ 4100	Auto	2.89	123	6	4800
Mercedes-Benz 300D	$10,000	Six	183	3.35 x 3.46	8.55	180 @ 5500	4[1]	4.67	124	5	4110
Facel Vega Excellence	$12,981	Vee-eight	383	4.03 x 3.75	10.0	355 @ 4800	Auto	3.31	124.8	4	4220
Bentley S2 & Rolls-Royce Silver Cloud II	$15,355	Vee-eight	380	4.10 x 3.60	8.0	Not released by factory	Auto	3.08	123	5	4350
Rolls-Royce Phantom V	$26,320	Vee-eight	380	4.10 x 3.60	8.0	Not released by factory	Auto	3.89	143	7	5000
STATION WAGONS • Up to $2000											
Hillman Husky	$1579	Four	84.8	3.00 x 3.00	8.0	51 @ 4400	4	4.56	86	4	2032
Goggomobil T 700 Roustabout	$1595	Flat-twin	42.0	3.07 x 2.83	7.2	33 @ 4900	4	5.20	78.7	4	1465
Austin & Morris 850 Countryman	$1600	Four	51.8	2.48 x 2.69	8.3	37 @ 5500	4	3.76	84	4	1400
Fiat 600D Multipla	$1658	Four	46.8	2.44 x 2.50	7.5	32 @ 4800	4	3.38	78.8	6	1588
Ford Escort	$1714	Four	71.5	2.50 x 3.64	7.0	36 @ 4500	3	4.43	86.8	4	1780
Morris Minor 1000	$1798	Four	57.9	2.48 x 3.00	8.3	37 @ 5000	4	4.55	86	4	1764
Datsun Bluebird	$1818	Four	72.5	2.87 x 2.79	7.5	48 @ 4800	3	4.63	89.8	5	2026
Austin A40	$1835	Four	57.9	2.48 x 3.00	8.3	38.5 @ 5000	4	4.55	83.5	4	1610
Fiat 1100	$1918	Four	66.5	2.68 x 2.95	7.0	43 @ 4800	4	3.86	92.1	4	1879
STATION WAGONS • $2000 to $2500											
Hansa 1100	$2024	Flat-four	66.6	2.91 x 2.52	7.3	46 @ 4250	4	4.00	89.4	4	2070
Sabra	$2050	Four	60.8	3.19 x 1.91	8.9	41 @ 5000	4	5.14	85.0	4	1650
Rambler American Deluxe 2-door	$2080	Six	196	3.13 x 4.25	8.0	90 @ 3800	3[1]	3.31	100	5	2540
Toyopet Crown Custom	$2080	Four	115.8	3.46 x 3.07	8.3	95 @ 5000	3	4.88	99.6	6	2700
Ford Falcon 2-door	$2225	Six	144	3.50 x 2.50	8.7	90 @ 4200	3[1]	3.50	109.5	6	2300
Vauxhall Victor	$2263	Four	92.0	3.13 x 3.00	7.8	55 @ 4200	3	4.62	98.0	5	2350
Saab 95	$2265	Three	51.3	2.76 x 2.87	7.3	42 @ 5000	3[14]	5.23	98.0	5	1870
Chevrolet Corvair Lakewood Series 500	$2266	Flat-six	145	3.44 x 2.60	8.0	80 @ 4400[2]	3[1]	3.80	108	6	2540
Opel Rekord Caravan	$2293	Four	102.5	3.35 x 2.91	7.8	64 @ 4200	3	4.22	100	5	2070
Hillman Minx	$2299	Four	91.2	3.11 x 3.00	8.5	56 @ 4600	4[1]	4.78	96	4	2280
Comet 2-door	$2310	Six	144[6]	3.50 x 2.50	8.7	90 @ 4200[7]	3[1]	3.50	109.5	6	2400
Auto Union Universal	$2321	Three	59.8	2.90 x 2.10	7.25	50 @ 4500	4	4.71	96.5	5	2315
Plymouth Valiant V-100	$2327	Six	170[5]	3.40 x 3.13	8.2	101 @ 4400[8]	3[1]	3.55	106.5	6	2688
Dodge Lancer Series 170	$2354	Six	170[5]	3.40 x 3.13	8.2	101 @ 4400[8]	3[1]	3.55	106.4	6	2860
Studebaker Lark Deluxe V-8	$2425	Vee-eight	259[6]	3.56 x 3.25	8.8	180 @ 4500	3[1]	3.31	113	6	3110
Pontiac Tempest	$2438	Four[4]	194.5	4.06 x 3.75	8.6	110 @ 3800[9]	3[1]	3.55	112	6	2912
Peugeot 403	$2490	Four	89.6	3.15 x 2.87	7.5	66 @ 4750	4	4.69	114.5	5	2575

Make and Model	Price	Number of Cylinders	Displacement (Cubic Inches)	Bore and Stroke	Compression Ratio	BHP @ RPM	Speeds Forward	Top Ratio	Wheelbase	Seating	Dry Weight
STATION WAGONS • $2500 and up											
Buick Special Standard	$2681	Vee-eight	215	3.50 x 2.80	8.8	155 @ 4600	3[1]	3.36	112	6	2780
Oldsmobile F-85 Standard	$2681	Vee-eight	215	3.50 x 2.80	8.75	155 @ 4800	3[1]	3.07	112	6	2735
Fiat 2100	$3058	Six	125	3.03 x 2.89	8.8	90 @ 5000	4	4.30	104.3	6	3208
Citroen	$3340	Four	116.6	3.07 x 3.94	7.5	70 @ 4500	4	3.31	123	8	2400
Land Rover Long Wheelbase	$3510	Four	139.5	3.56 x 3.50	7.0	77 @ 4250	8	5.39	109	10	3225
Humber Super Snipe	$4675	Six	180	3.44 x 3.25	8.0	130 @ 4800	3	4.55	110	5	3181
CONVERTIBLES											
Morris 1000	$1574	Four	57.9	2.48 x 3.00	8.3	37 @ 4800	4	4.50	86	4	1677
Volkswagen	$2055	Flat-four	72.7	3.03 x 2.52	7.0	40 @ 3900	4	3.88	94.5	4	1764
Hillman Minx	$2099	Four	91.2	3.11 x 3.00	8.5	56.5 @ 4600	4[1]	4.55	96	4	2172
Singer Gazelle	$2349	Four	91.2	3.11 x 3.00	8.5	64 @ 4600	4	4.55	96	4	2268
Rambler American Custom	$2369	Six	196	3.27 x 4.22	8.0	90 @ 3800	3	3.78	100	5	2637
Studebaker Lark Regal Six	$2554	Six[4]	170	3.0 x 4.0	8.5	112 @ 4500	3[1]	4.10	108.5	5	3034
Ford Zephyr	$2599	Six	156	3.26 x 3.15	7.8	90 @ 4500	3	3.90	107	4	2688
Citroen	$4000	Four	116.6	3.07 x 3.94	7.5	75 @ 4500	4	3.30	123	5	2460
GRAND TOURERS • Up to $2500											
Fiat 500	$1228	Two	29.2	2.60 x 2.76	7.0	21 @ 4400	4	4.49	72.4	4	1040
Autobianchi Bianchina	$1298	Two	29.2	2.60 x 2.76	7.0	21 @ 4400	4	4.49	72.4	2	1100
Metropolitan	$1673	Four	90.9	2.88 x 3.50	8.3	51 @ 4250	3	4.22	85	2	1860
BMW 700	$1898	Flat-twin	42.5	3.07 x 2.87	7.1	35 @ 5200	4	4.50	83.5	2	1390
Fiat 600 Jolly	$1906	Four	46.8	2.44 x 2.48	7.5	29 @ 4800	4	4.37	79	5	1270
Abarth Fiat 750	$2050	Four	45.6	2.40 x 2.52	9.0	46 @ 5500	4	4.08	78.7	4	1320
Datsun Fair Lady	$2099	Four	72.5	2.88 x 2.80	7.5	48 @ 4800	4	4.63	87.4	4	1950
Triumph Herald	$2149	Four	57.9	2.48 x 2.99	8.5	50 @ 6000	4	4.55	91.5	4	1650
NSU Sport Prinz	$2200	Two	35.6	2.96 x 2.60	7.6	36 @ 5500	4	4.78	78.9	2	1180
Chevrolet Corvair Monza 900 Sport Cpe.	$2201	Flat-six	145	3.44 x 2.60	8.0	80 @ 4400[2]	3[1,14]	3.27	108	5	2380
Renault Caravelle	$2295	Four	51.5	2.28 x 3.15	8.0	40 @ 5000	4	4.50	89	4	1650
Hansa 1100	$2365	Flat-four	66.7	2.91 x 2.52	7.9	55 @ 5000	4	4.00	89	2	1900
Sunbeam Rapier	$2499	Four	91.2	3.11 x 3.00	9.2	78 @ 5400	4	4.55	96	4	2270
GRAND TOURERS • $2500 and up											
Studebaker Hawk	$2650	Vee-eight	289	3.56 x 3.62	8.8	210 @ 4500	3[1,14]	3.31	120.5	4	3207
Volkswagen Karmann-Ghia	$2695	Flat-four	72.7	3.03 x 2.52	7.0	40 @ 3900	4	3.88	94.5	2	1808
Saab GT 750	$2790	Three	45.6	2.60 x 2.87	9.8	48 @ 5000	4	4.32	98	4	1740
Simca Oceane	$2795	Four	78.7	2.91 x 2.95	8.2	60 @ 5400	4	4.44	96	2	2068
Borgward Isabella TS	$3550	Four	91.1	2.95 x 1.89	8.2	82 @ 5400	4	3.90	102	5	2420
Auto Union 1000SP	$3925	Three	59.8	2.91 x 2.99	8.0	60 @ 4500	4	4.31	93	2	2010
Lancia Appia	$3952	Vee-four	66.5	2.67 x 2.95	8.0	53 @ 4900	4	4.09	98.8	2	2057
Ford Thunderbird Hardtop	$4170	Vee-eight	390	4.05 x 3.78	9.6	300 @ 4600	Auto	2.91	113	4	3887
Chrysler 300G Hardtop	$5411	Vee-eight	413	4.18 x 3.75	10.0	375 @ 5000	Auto[13]	3.23	126	4	4310
Lea-Francis Lynx	$5900	Six	156	3.46 x 3.34	10.0	121 @ 4500	4	4.10	99	2	2240
Alvis TD.21	$7000	Six	183	3.31 x 3.54	8.5	115 @ 4000	4	3.77	111.5	4	3300
Mercedes-Benz 220SE	$8141	Six	134	3.16 x 2.88	8.7	134 @ 5000	4	4.10	108.2	4	2970
Facel Vega HK 500	$9000	Vee-eight	384	4.12 x 3.38	10.0	360 @ 3600	Auto	3.31	104.7	4	3416
Ghia L.6.4	$15,000	Vee-eight	383	4.25 x 3.38	10.0	335 @ 4600	Auto	3.23	115	4	4100
Bentley Continental	$23,215	Vee-eight	380	4.10 x 3.60	8.0	Not released by factory	Auto	2.92	123	5	4100
SPORTS CARS • Up to $2700											
Austin Healey Sprite	$1795	Four	57.9	2.48 x 3.00	8.3	48 @ 5000	4	4.22	80	2	1428
Berkeley B95	$1795	Two	42.2	2.76 x 3.54	7.25	41 @ 5500	4	4.31	69.1	2	849
Berkeley B105	$1825	Two	42.23	2.76 x 3.54	8.0	51 @ 6250	4	4.31	69.1	2	887
Innocenti 950	$1950	Four	57.9	2.48 x 3.00	8.3	48 @ 5000	4	4.22	80	2	1450
Berkeley Bandit	$2234	Four	60.8	3.18 x 1.91	8.9	39 @ 5000	4	4.13	82	2	1344
Austin-Healey Sprite Sebring Specifications	$2270	Four	57.9	2.48 x 3.00	9.3	58 @ 5800	4	4.22	80	2	1428
Morgan 4/4 Series III	$2340	Four	60.8	3.18 x 1.91	8.9	39 @ 5000	4	4.3	96	2	1450
Turner 950	$2345	Four	57.9	2.48 x 3.00	8.3	48 @ 5000[10]	4	4.22	81	2	1175
MGA	$2444	Four	96.9	2.96 x 3.50	8.3	79 @ 5600	4	4.30	94	2	1337
Fiat 1200 Cabriolet	$2595	Four	74.5	2.83 x 2.95	8.25	55 @ 5300	4	4.30	92.1	2	1930
Sunbeam Alpine	$2595	Four	97.1	3.21 x 3.00	9.1	85.5 @ 5000	4	3.89	86	2	2082
Triumph TR 3	$2675	Four	121.5	3.27 x 3.62	8.5	100 @ 5000	4	4.11	88	2	2135

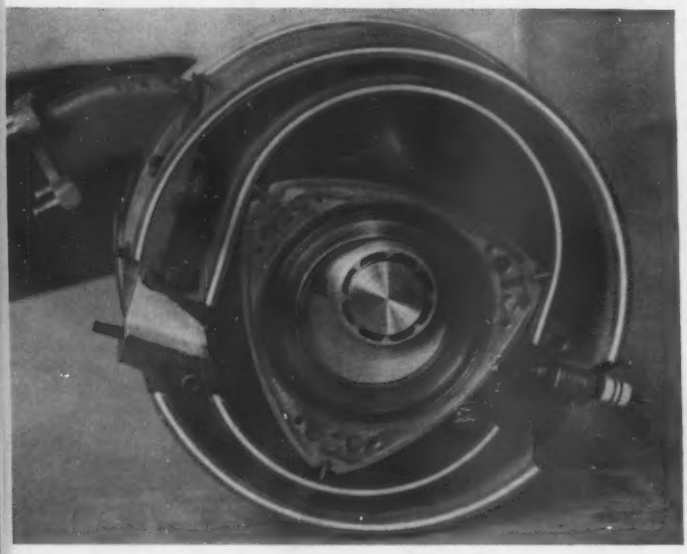
1 Automatic optional
2 98 @ 4600 optional
3 145 @ 5200 optional
4 Vee-eight optional
5 225 optional
6 170 optional
7 101 @ 4400 optional
8 215 optional
9 155 @ 4600 optional
10 80 @ 6500 optional
11 102 @ 7000 optional
12 125 @ 6000 optional
13 Three-speed optional
14 Four-speed optional

Make and Model	Price	Number of Cylinders	Displacement (Cubic Inches)	Bore and Stroke	Compression Ratio	BHP @ RPM	Speeds Forward	Top Ratio	Wheelbase	Seating	Dry Weight
SPORTS CARS • $2700 to $3600											
Morgan Plus 4	$2810	Four	121.5	3.27 x 3.62	8.5	100 @ 5000	4	4.11	96	2	1837
Lotus Seven Series 2	$2925	Four	57.8	2.48 x 3.00	8.3	48 @ 5200	4	4.88	88	2	895
Devin D	$2950	Flat-four	72.7	3.03 x 2.52	7.0	40 @ 3900	4	3.88	82	2	1100
Austin-Healey 3000	$3051	Six	178	3.28 x 3.50	9.03	130 @ 4750	4	3.55	92	2	2513
Turner Climax	$3170	Four	66.9	2.98 x 2.83	9.8	75 @ 6000	4	4.50	80.5	2	1372
Abarth Fiat 850	$3195	Four	50.8	2.44 x 2.72	9.0	62 @ 6000	4	4.55	78.7	2	1320
D.B.	$3195	Flat-twin	51.9	3.35 x 2.95	7.2	54 @ 5000	4	4.52	84	2	1287
Alpine Tour de France	$3200	Four	60.9	2.48 x 3.15	9.7	68 @ 6250	5	4.72	82.7	2	1199
Elva Courier	$3275	Four	96.9	2.96 x 3.50	8.3	79 @ 5600	4	3.73	90	2	1270
Fiat 1500	$3298	Four	90.9	3.07 x 3.07	8.7	80 @ 6000	4	4.30	92.1	2	2117
Sabra Sports	$3300	Four	103.9	3.23 x 3.12	7.8	61 @ 4400	3	4.11	104.5	2	1400
Alfa Romeo Giulietta Spider	$3520	Four	78.8	2.91 x 2.95	8.0	92 @ 6000	4	4.55	86.6	2	1850
SPORTS CARS • $3600 to $4200											
Daimler SP 250	$3702	Vee-eight	156	3.00 x 2.75	8.2	155 @ 5800	4	3.58	92	2	2100
Porsche 1600 Roadster	$3794	Flat-four	96.5	3.25 x 2.91	7.5	70 @ 4500	4	3.77	82.7	2	1840
Volvo P1800	$3795	Four	108.6	3.31 x 3.15	9.5	100 @ 5500	4	4.56	94.7	2	2350
Alfa Romeo Giulietta Sprint	$3843	Four	78.8	2.91 x 2.95	8.0	92 @ 6000	4	4.55	93.7	4	1875
Alfa Romeo Giulietta Super Spider	$3890	Four	78.8	2.91 x 2.95	9.1	104 @ 6000	4	4.10	86.6	2	1885
Chevrolet Corvette	$3934	Vee-eight	283	3.88 x 3.00	9.5	230 @ 4800	3[14]	3.36	102	2	2905
Porsche 1600 Coupe	$3934	Four	96.5	3.25 x 2.01	7.5	80 @ 4500	4	3.61	82.7	2	1900
Arnolt Bristol Competition	$3995	Six	120	2.60 x 3.78	9.0	125 @ 5750	4	3.90	96.2	2	2200
Porsche 1600 Super Roadster	$4009	Flat-four	96.5	3.25 x 2.91	8.5	88 @ 5000	4	3.77	82.7	2	1840
Lancia Appia Zagato	$4095	Vee-four	66.5	2.68 x 2.95	8.0	65 @ 4900	4	4.09	98.5	2	1848
Facel Vega Facellia	$4140	Four	100.5	3.22 x 3.07	9.4	112 @ 6250	4	4.10	96.5	2	2350
Alfa Romeo Sprint Veloce	$4149	Four	78.8	2.91 x 2.95	9.1	104 @ 6000	4	4.10	93.7	4	1875
Porsche 1600 Super Coupe	$4154	Flat-four	96.5	3.25 x 2.91	8.5	88 @ 5000	4	3.62	82.7	2	1840
SPORTS CARS • $4200 to $6000											
Porsche Super 90 Roadster	$4334	Flat-four	96.5	3.25 x 2.91	9.0	102 @ 5500	4	3.77	82.7	2	1840
Facel Vega Facellia 2 Plus 2 Coupe	$4360	Four	100.5	3.22 x 3.07	9.4	112 @ 6250	4	4.10	96.5	4	2400
Porsche Super 90 Coupe	$4484	Flat-four	96.5	3.25 x 2.91	9.0	102 @ 5500	4	3.61	82.7	2	1900
Jaguar XK 150	$4643	Six	231	3.43 x 4.17	8.0	220 @ 5500	4	3.54	102	2	2080
Chevrolet Corvette with fuel injection	$4886	Vee-eight	283	3.88 x 3.00	11.0	315 @ 6200	4	3.70	102	2	2900
Mercedes-Benz 190SL	$5082	Four	116	3.35 x 3.29	8.5	120 @ 5800	4	3.89	94.5	2	2330
Jaguar XK 150S	$5120	Six	231	3.43 x 4.17	9.0	265 @ 5500	5	3.09	102	2	3100
Alfa Romeo 2000	$5372	Four	120.5	3.35 x 3.46	8.5	133 @ 5700	5	4.08	98.4	2	2600
Lotus Elite	$5495	Four	74.2	3.00 x 2.62	9.5	75 @ 6100[11]	4	3.90	90	2	2128
Jaguar XKE	Under $6000	Six	231	3.43 x 4.17	9.0	265 @ 5500	4	3.31	96.0	2	2464
Alfa Romeo Giulietta Sprint Speciale	$5555	Four	78.8	2.91 x 2.95	9.7	114 @ 6000	4	4.55	88.5	2	1890
A.C. Ace-Bristol	$5695	Six	120	2.60 x 3.78	9.0	125 @ 5750	4	3.92	90	2	1685
Abarth Fiat 1600	$5885	Four	96.8	3.17 x 3.07	9.0	100 @ 5500	4	4.30	92.1	2	2110
Abarth Fiat 1000	$5900	Four	59.8	2.56 x 2.91	9.3	90 @ 7100	4	4.05	78.7	2	1200
SPORTS CARS • $6000 to $10,000											
Lancia Flaminia Zagato	$6485	Vee-six	150	3.15 x 3.19	9.0	132 @ 5100	4	3.46	113	2	2632
Abarth Fiat 2200	$6666	Six	132	3.11 x 3.06	9.0	150 @ 6000	4	3.64	96.5	2	2560
A.C. Aceca-Bristol	$6825	Six	120	2.59 x 3.78	8.5	120 @ 6000[12]	4	3.9	90	2	2128
Frazer-Nash Continental	$7000	Vee-eight	193	3.23 x 2.95	8.2	173 @ 5000	4	3.42	99	2	1976
Jensen 541-S	$7750	Six	244	3.43 x 4.72	7.4	150 @ 4100	4	2.90	105	4	3124
A.C. Greyhound	$8400	Six	135	2.70 x 3.92	8.5	105 @ 4700	5	3.32	114	4	3010
Gordon GT	$8526	Vee-eight	283	3.88 x 3.00	9.5	230 @ 4800	4	3.70	102	4	2880
Bocar XP-5	$8700	Vee-eight	283	3.88 x 3.00	11.0	315 @ 6200	4	3.70	91	2	1775
SPORTS CARS • $10,000 and up											
Devin SS	$10,000	Vee-eight	283	3.88 x 3.00	10.5	290 @ 6200	4	3.70	92	2	1800
Aston Martin DB4	$10,400	Six	224	3.62 x 3.62	8.25	263 @ 5700	4	3.54	98	4	2925
Mercedes-Benz 300SL	$10,950	Six	183	3.35 x 3.46	8.55	240 @ 6100	4	3.89	94.5	2	2930
Maserati 3500 GT	$11,400	Six	213	3.38 x 3.94	8.5	230 @ 5500	4	3.54	102.3	4	2800
Aston Martin DB4/GT	$12,500	Six	224	3.62 x 3.62	9.0	326 @ 6000	4	3.54	93	2	2700
Ferrari 250/GT Cabriolet	$12,600	Vee-twelve	180	2.87 x 2.32	8.8	240 @ 7000	4	4.56	102.4	2	2640
Ferrari 250/GT California	$12,600	Vee-twelve	180	2.87 x 2.32	9.2	280 @ 7000	4	4.57	94.5	2	2200
Ferrari 250/GT 2 Plus 2	$12,600	Vee-twelve	180	2.87 x 2.32	8.8	240 @ 7000	4	4.56	102.4	4	2816
Bocar Stiletto	$13,000	Vee-eight	283	3.88 x 3.00	9.5	500 @ 8500	4	3.70	101	2	1740
Ferrari 250/GT Berlinetta	$14,000	Vee-twelve	180	2.87 x 2.32	9.2	280 @ 7000	4	4.57	94.5	2	2110
Maserati 5000 GT	$17,000	Vee-eight	304	3.88 x 3.19	8.5	345 @ 6200	4	3.08	102.4	2	3200

TECHNIQUE OF TOMORROW'S POWER

by Karl Ludvigsen

During 1960 Felix Wankel's remarkable engine sent Germany's stock market sky-high and set great corporations at each other's throats. Here's the latest detailed information on Tomorrow's Power.



MOLTER

► In the year and a half that's passed since the Wankel engine was revealed to the world, it's been the subject of intensive development work at NSU and Curtiss-Wright, and the subject of vast speculation on the part of the press and financial circles. Most lingering doubts about this remarkable engine were swept away by the two excellent papers presented by C-W and NSU engineers in January at the SAE's International Congress and Exposition of Automotive Engineering. Practically all criticism of Felix Wankel's creation has been based on inadequate knowledge and understanding; these papers leave little room for that. Before the field diversifies beyond its original basics, as it's bound to do as development proceeds, CAR AND DRIVER presents here the elemental geometry of the Wankel engine, followed by some of the comments of the men who are employing it so successfully.

If you read our introductory story in SCI for February, 1960, you know what forces make the Wankel engine go 'round. If you're seeing the engine here for the first time, we can do no more than refer you to that story. In the brilliance of hindsight, however, we should point out that the exact shapes of the rotor and housing shown in that article are not completely correct. The rotor's tips are too rounded, and would not allow the tip seals to contact the housing walls at all times. But the way the rotor moves and the explanation of the engine's operation remain fully valid.

HOW TO RATE IT

In SCI a year ago we discussed the original experimental engine built by NSU to prove the principle. Three of these *DKM's* were built, one going to Curtiss-Wright for preliminary tests. By a "kinematic conversion", as Dieter Korp described it, this layout was changed to one in which the housing stands still and the central rotor "circulates" and rotates at the same time, leading to the new designation *KKM* (*Kreiskolbenmotor*). This is the version that has seen serious development on both sides of the Atlantic and with which we'll concern ourselves exclusively in the future.

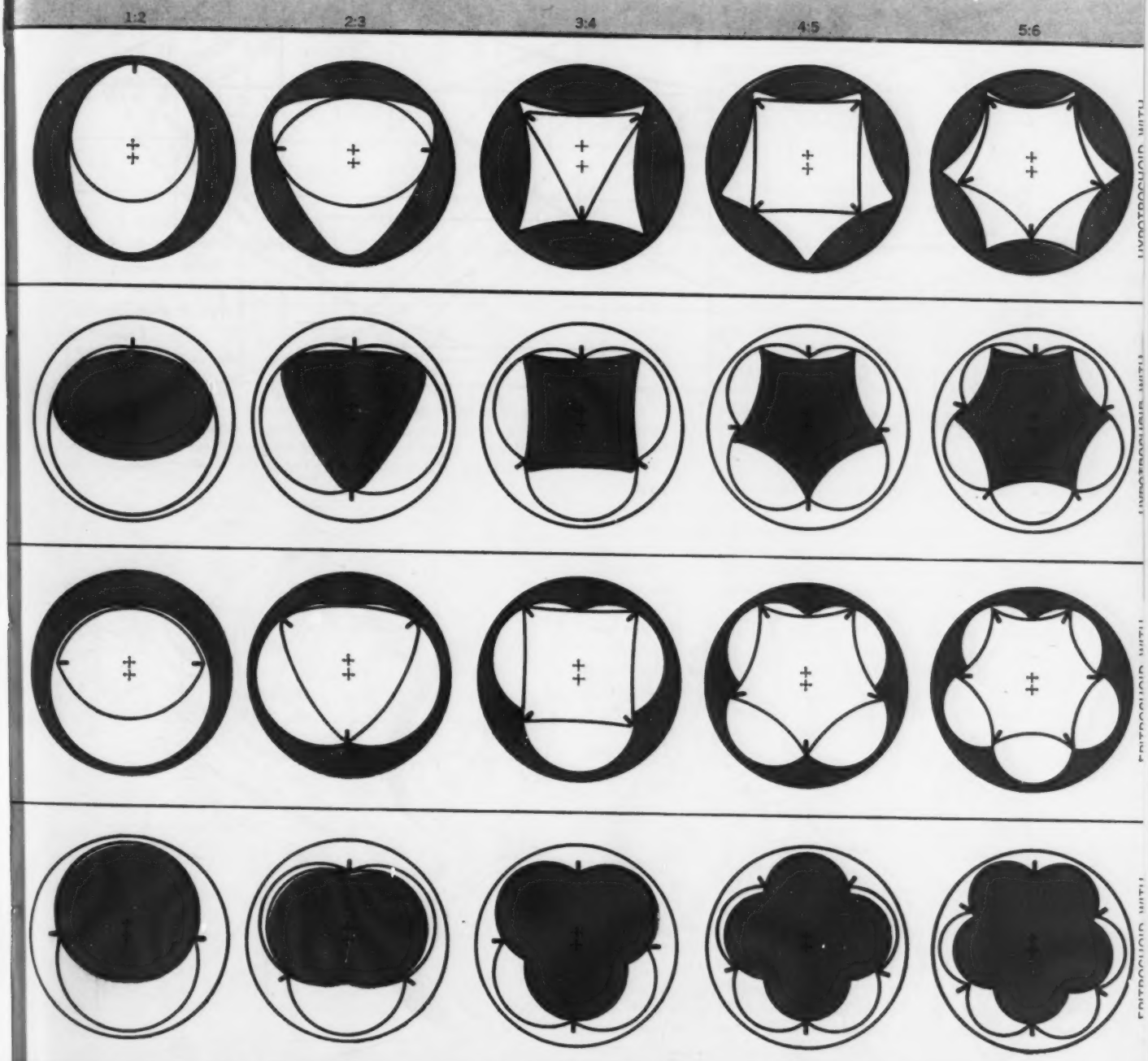
In the KKM, shown back in February, 1960, the output shaft turns at three times the speed of the rotor (which also "circulates"). The mechanical relationship between DKM and KKM is such that the output shaft speeds and rotor sliding speeds are directly comparable: in both engines *there's one power stroke for each revolution of the output shaft.* On this basis NSU's engineers have likened the engine to a two-stroke, which of course has the same power-stroke frequency, and have urged that it be rated in the same way as a two-stroke with regard to displacement, specific power, etc. As the respective designs stand today, this makes a certain amount of sense – though only if you compare the *best* two-stroke to the *poorest* Wankel engine! One of the best two-strokes going is the East German M.Z., which extracts 22 bhp from 125 cc at 12,000 rpm. The original 125 cc DKM 54 developed 29 bhp at 16,000, while the newer KKM 125 showed a drop to 26 bhp at 11,000 rpm.

Of course it must be emphasized that the Wankel engine goes through an actual four-stroke cycle which, after development, can be considerably more efficient than it is today, while that M.Z. engine is probing the outer limits of two-stroke performance. This relation to the two-stroke is certain: when calculating relations of bmep, torque, bhp and rpm for the Wankel engine, use two-stroke formulas. In the meantime the way it's rated seems less important to us than does its output per pound of weight and fuel consumed.

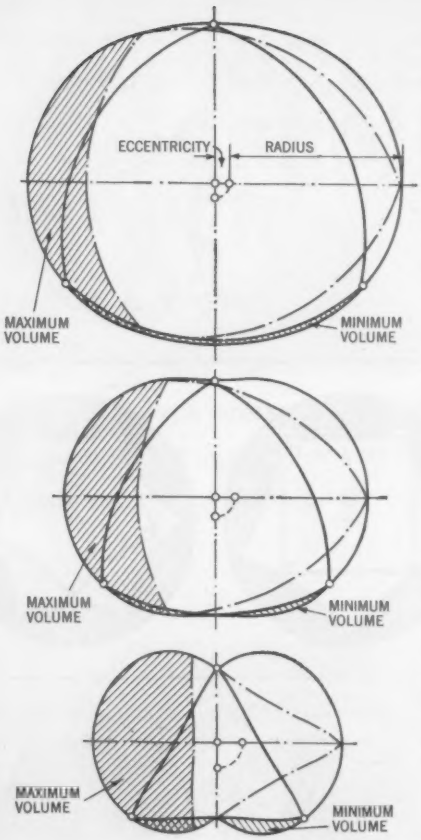
SOME LIGHT GEOMETRY

Let's pin down this "trochoidal" shape that's referred to so often in connection with this engine. The shape called "trochoid" is produced by a point on a circle that's rolling, without slipping, around the rim of another circle. If the point is actually on the rim of the rolling circle, a special kind of trochoid results – a cycloid. And there's a difference too, if the rolling circle is on the inside or the outside of the stationary one. If it's on the inside, a *hypo*trochoid results; if on the outside, an *epi*trochoid is formed. To produce shapes that are useful for Wankel engine design, the circles involved have to be multiples of each other in size, i.e. one can be twice the diameter of the other, or three times, but not 2½ – for example. By trying different size relationships, and by varying the position of the point on the rolling circle, a vast variety of trochoids can be created.

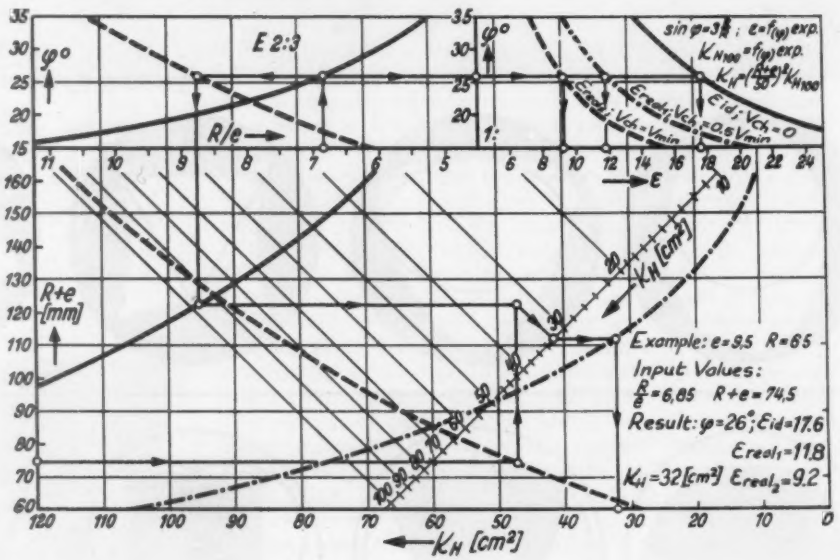
Now to avoid useless complication we'll call on you for a demonstration of "faith" as we jump from the geometrical definition to the mechanical fact. As these trochoids themselves are rotated in relation to an "opposing plane" – which also rotates, at a different speed and on an axis offset by a fixed "eccentricity" – their outlines sweep aside certain adjacent areas, leaving inner and outer related figures referred to as "envelopes". An accompanying illustration shows a basic family of hypotrochoids and epitrochoids, together with the inner and outer envelopes that are developed in this way. Hypotrochoids turn at the slower of the relative speeds shown; epitrochoids (*Continued overleaf*)

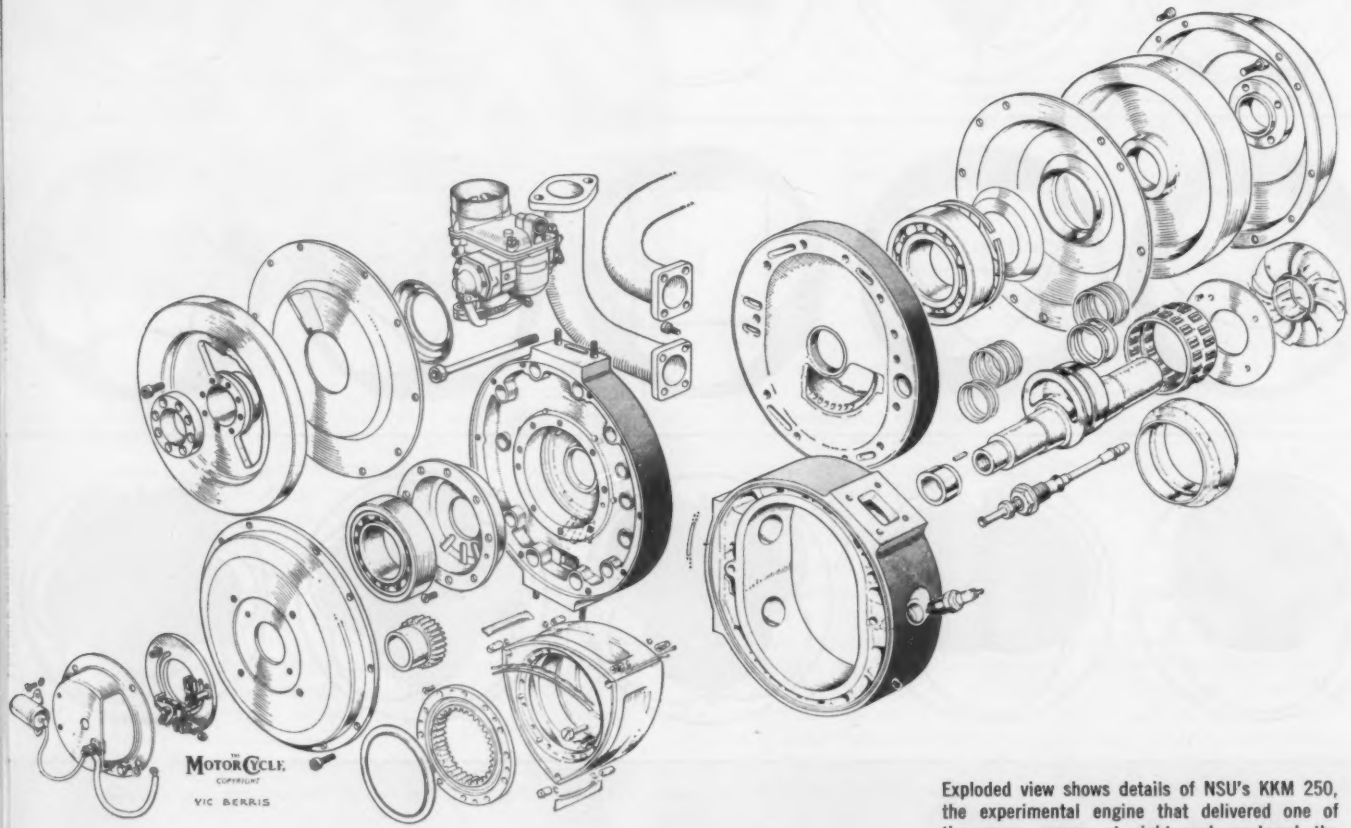


Here's the family of possible rotor engine forms referred to in the text. Most practical are second and third from left in the third row from the top.

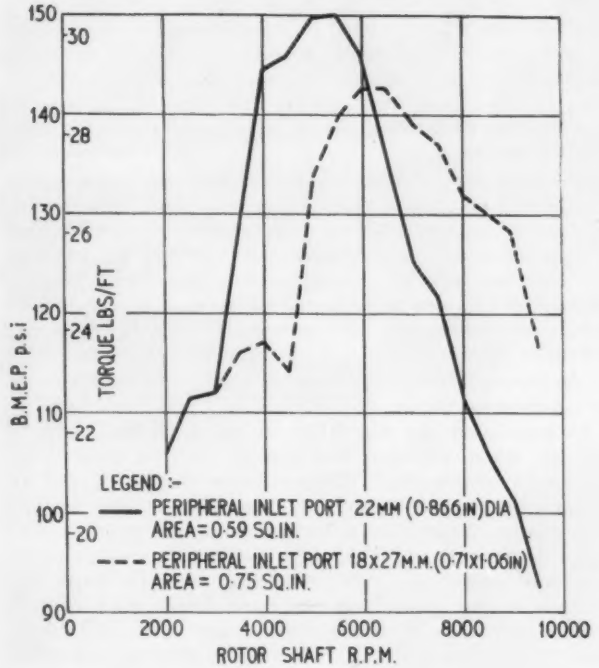


Drawings at left show the effect, on the shape of the engine, of changes in the proportion of radius to eccentricity. From top to bottom the R/e is 11.5, 7.1 and 3.9. Below is a nomogram which you can use to compute displacement of a Wankel engine from its rotor radius (R) and eccentricity (e), as we've done in the example indicated by the arrowed lines. Result shows chamber area (shaded in drawings at left) of 32 square centimeters, which must be multiplied by width of chamber to get displacement figure.

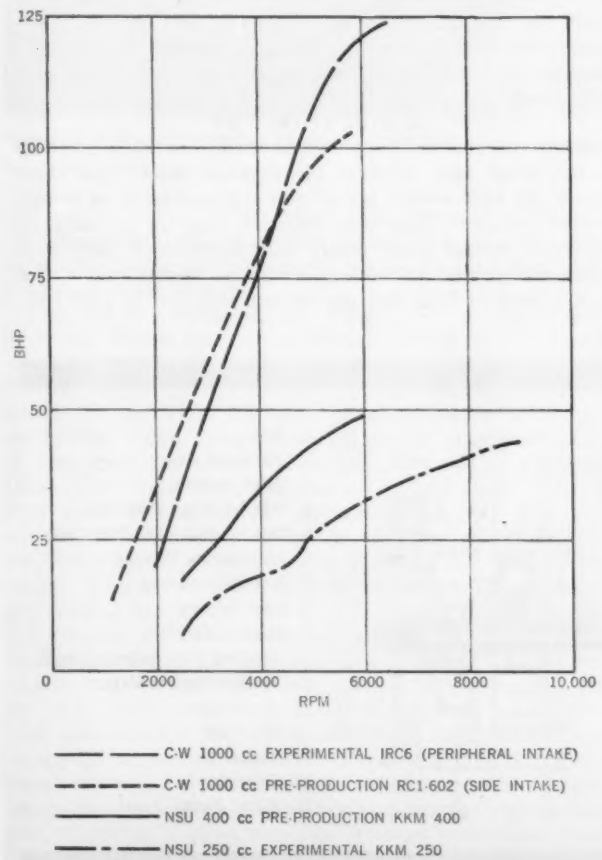




Exploded view shows details of NSU's KKM 250, the experimental engine that delivered one of the power curves at right and produced the porting data at upper right. The unit shown has the smaller round peripheral intake passage.



Graph above shows how a change in area of intake port affects Wankel engine torque curve: smaller port improves bottom-end output. Power curves below show how makers are concentrating on output below 6000 rpm, also how change in intake port location affects C-W engine curve.



at the faster rate. The trochoids themselves are shown as shaded, and the points of continuous contact between the trochoids and their respective envelopes are also indicated.

This drawing shows the basic family of possible rotor engine forms that Felix Wankel was able to correlate, to bring order out of the chaos that had existed until his time. Knowing what the possibilities were, Wankel could probe their strong and weak points to select those best suited to internal-combustion engine use. Many of these layouts are already known to the engineering world; the Eaton Gerotor oil pump relates closely to the 4:5 hypotrochoid with outer envelope, for example. But Wankel was the first to realize the potential of the epitrochoids with inner envelopes, the only series that could promise both decent swept volume and reasonable compression ratios.

SELECTING THE SHAPES

Originally some work was done with the 1:2 layout, which was already the basis for a blower marketed by the French firm of Planche & Cie., but converting it to an engine involved impossible complication. Next the 2:3 pattern was tried, and found to be ideal in every way for efficient four-cycle operation. This is the engine form on which all published experimental work has been done thus far, but Dr. Froede of NSU has dropped some provocative remarks about the potential of the 3:4 variant in that series. The third chamber the 3:4 ratio produces could be put to work as an additional expansion volume, to make maximum use of the expansion part of the cycle and possibly to reduce exhaust port and unit wall temperatures at the same time. Froede has most recently said, "All experience up to now was gained with the two-lobed epitrochoid, while the three-lobed engine is still in the designing stage. For certain applications a three-lobed type may prove superior." Has it a drawback? Bigger exterior bulk in relation to swept volume. The 1:2 engine is even more favorable on this point than the 2:3 layout, which is probably what led NSU to try the former first.

The fundamental parameters of the Wankel engine apply equally to both DKM and KKM types; we'll describe and illustrate them with reference to the KKM only. The basic dimensions, as fundamental to this engine as bore and stroke are to the piston engine, are the rotor radius (R) and the offset or eccentricity (e). The radius is actually the distance from the center of the rotor to its tips, and the eccentricity is the same as that described in the discussion of trochoid development above. In more mechanical terms, the eccentricity is the amount of offset between the engine's main bearings and the rotor-support bearing or, actually, half the engine's "stroke".

EFFECT OF R/e

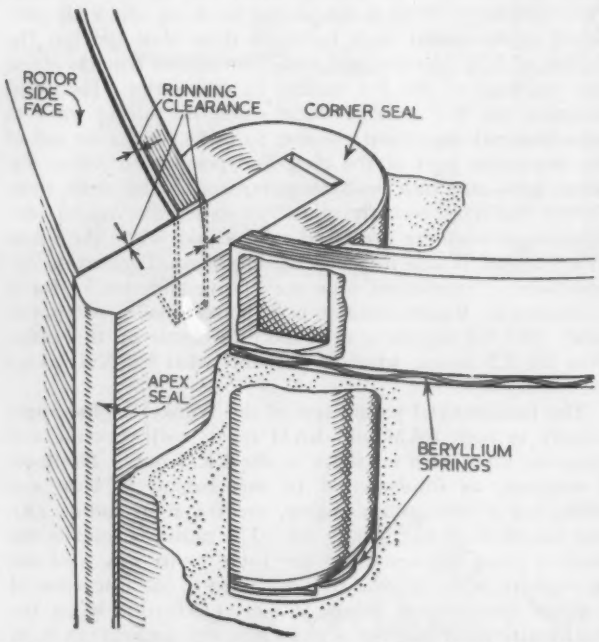
A drawing shows three Wankel engine layouts with the same chamber volume but with different ratios of radius to eccentricity. From top to bottom R/e is 11.5, 7.1 and 3.9, and the effects of these variations are clearly seen. When R/e is high, the overall size of the engine must be large in relation to the chamber volume, quite unlike the situation at a low R/e, which substantially reduces the package size. Is the latter the best? Not necessarily, because the maximum possible compression ratio deteriorates with decreasing R/e. The highest ratios that can be reached in each of these designs are as follows: 11.5: 30/1; 7.1: 18/1; 3.9: 10/1. 10 to one may seem like enough for an internal combustion engine, but it doesn't take into account the rotor grooves and other reshapings necessary to obtain an efficient combustion chamber.

A third factor is involved, one that bears no relation to piston engine practice. As the rotor goes through its involved motions, its tips and their radial seals take up angles to the surface of the epitrochoidal housing that vary from the perpendicular to an extreme value that depends on R/e. This angle of seal swing, or swing angle, increases as R/e

decreases (precisely, the sine of the maximum swing angle = 3 e/R), these being the values for the three examples: 11.5: 15°; 7.1: 25°; 3.9: 50°. The very large value for the 3.9 engine can be clearly seen in the bottom drawing, at the two left-hand tips of the rotor shown in dotted outline. Even without Felix Wankel's experience you can see this big swing angle won't help sealing, and in actual practice a general upper limit of 30° has been set on this angle. Diesel versions would use an angle between 15° and 20°, to get the high compression ratios needed.

HOW TO FIGURE IT

You can't just add or multiply R and e and come up with the chamber volume of a Wankel engine. The easiest way to get the displacement, maximum swing angle and maximum compression ratio is to use the "nomogram" that's printed on page 98. All you need to start with is R/e and R+e; in the example shown by arrowed lines these are 6.85 and 74.5 mm respectively, the actual figures for the original DKM 54 described in the May, 1960 SCI. You come out with a maximum angle of 26°, and a maximum possible c.r. of 17.6. Additional curves show what the c.r. will be with a groove in the rotor face with half the volume and with the whole volume of the minimum displacement: ratios of 11.8/1 and 9.2/1 respectively. Instead of actual displacement, the nomogram shows the maximum swept *area*, in this case 32 cm². To get displacement you have to multiply this by the rotor width, which is 3.9 cm in this case. 3.9 x 32 = 125 cc.



Latest seals take on relatively simple form shown above. This system is used in Curtiss-Wright's latest 1- and 2-liter engines, shown below.

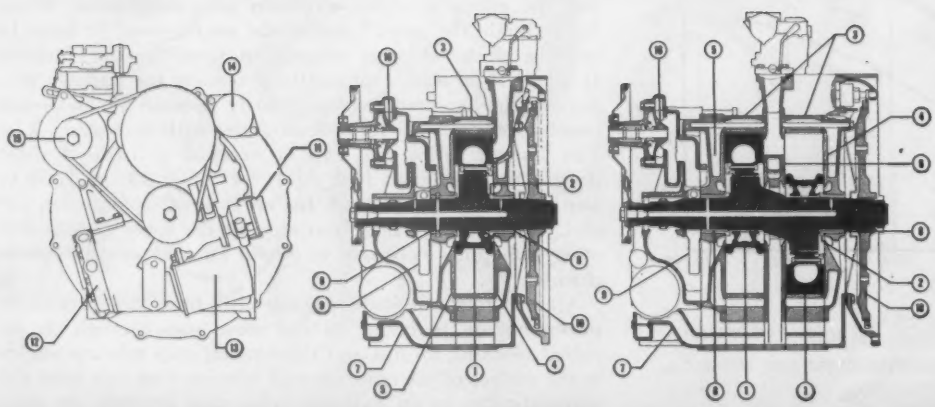
On most of the NSU-Wankel engines the rotor width has been close to four times the eccentricity. This gives a maximum chamber volume with a square central cross-section, since the distance from the "heel" of the rotor to the chamber wall in that position is 4e. Other engine dimensions can also be expressed in terms of R and e. The maximum diameter of the epitrochoid is 2 (R+e), while the minimum diameter is 2 (R—e). The pitch diameters of the gears governing rotor motion must be 4e for the inner gear and 6e for the outer.

As mentioned, the first DKM 54 had an R/e of 6.85, as did the KKM 125 that was directly derived from it by "kinematic conversion". When a new engine of 250 cc displacement was laid out, the KKM 250, an R/e of 7.77 was chosen to provide a higher maximum possible c.r., actually about 19.5/1. The sole reason for this was to allow more latitude for experimentation with the shape and location of the grooves on the rotor faces. With an 8/1 c.r., as shown in the KKM 250 in last July's SCI, these grooves must be much greater in volume than the minimum displacement. The 7.77 engine also has a more modest swing angle: 23°. Its actual measurements are: R: 85.5 mm; e: 11 mm.

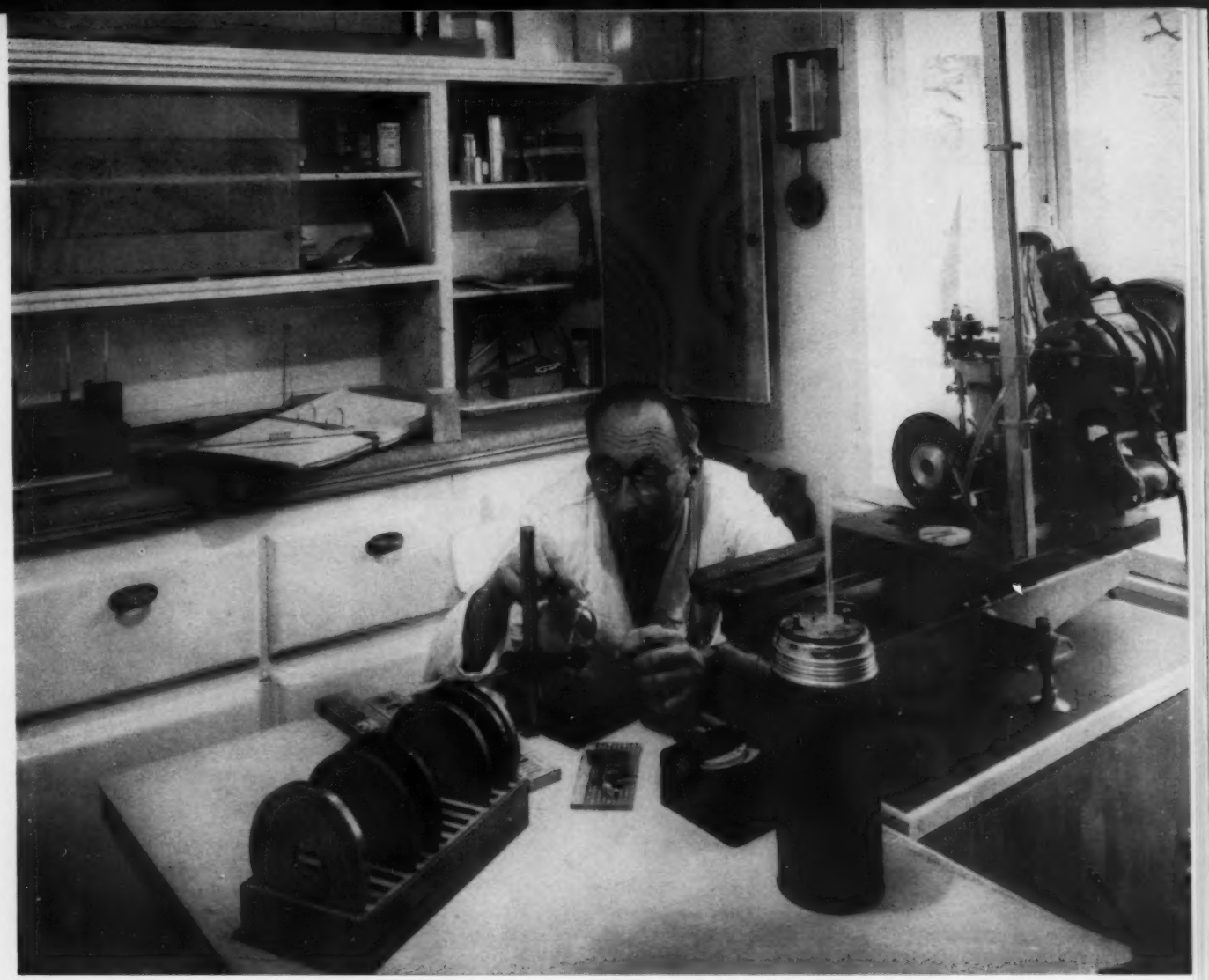
Interestingly, Curtiss-Wright progressed directly from its sample DKM 54 to its 1-liter IRC 6 unit without a change in R/e. Its dimensions are: R: 113.4 mm; e: 16.6 mm, giving an R/e of 6.85 again. C-W did consider other R/e values but, lacking NSU's experience, elected to stay with the known values until more familiarity with the engine was gained.

SLIDING AT THE TIPS

Much concern has been voiced about the sliding speeds at the rotor tips. A little investigation shows that these figures are well within reason and not unrelated to piston-engine practice. The most extreme case is the original DKM 54, whose pure rotary motion allowed very high rotational speeds. Its sliding speeds at 15,000 rpm varied from a peak of 9600 feet per minute to a low of 3700 fpm.



1. Rotor
2. Stationary Gear
3. Rotor Housing
4. Side Housing - Drive Side
5. Side Housing - Anti-Drive Side
6. Intermediate Housing
7. Accessory Housing
8. Main Bearing
9. Balance Weight
10. Flywheel Cum Balance Weight
11. Ignition Contact Maker
12. Oil Pumps
13. Oil Filter
14. Starter
15. Generator
16. Water Pump



Apparatus in Wankel's erstwhile kitchen was used to test wear rates of seal materials and confirm that rocking motion of tip seals reduces wear rate.

and averaged about 6700 fpm. These may be related to high-speed reciprocating engines, whose sliding speeds range from zero (twice per revolution) to about 6500 fpm, with a mean of about 4000 fpm.

The KKM version of the DKM 54 was taken only to about 11,000 rpm, at which its average sliding speed was about 5000 fpm (a simple formula for this is: fpm = .0069 × rpm × R (mm), though a complete plot of speeds for the KKM 250 indicates a dimension of R+¼e would give a more accurate average speed). At its usual peak of 9000 rpm, the KKM 250 exhibits a mean tip speed of about 5500 fpm, while the Curtiss-Wright IRC 6, at its 6000 rpm running speed, averages about 4700 feet per minute. Especially in view of the unidirectional motion of the tips and seals, these speeds are certainly in a controllable region. This, in fact, is one of the fundamental virtues of the Wankel design.

A variety of forces work on the tip seals, including centrifugal force, gas pressure and friction against the engine wall. A basic feature of all the Wankel seals is the use of gas or combustion pressure to augment their action, as is naturally the case with piston rings, and this pressure is enough to control the seals properly over most of the rotor's travel. There is one point where trouble cropped up, in the leading seal of the two that bracket the combustion volume at a given moment. Though combustion pressure is pushing that seal "ahead", wall friction could occasionally push "back". When that happened the supply of gas pressure to the base of the seal was cut off, allowing the pressure up top to push the seal down in its groove and away from contact with the wall. Centrifugal force threw it back again, and the cycle was ready to begin once more.

This process resulted in a fluttering of the seals as they passed through that part of the engine cycle, hence a galling of the trochoidal wall. This problem was attacked in three ways. One was to reduce the seals' clearance in their grooves to an amount (about .001 inch) that would damp their motion without causing seizure. Another was to insert flat springs of beryllium bronze under the seals to brace them against the wall (they were used under all the seals, to aid starting and low-speed operation too). The final step was chrome-plating the running surface to reduce the friction that started all the trouble in the first place. Some galling of this type still persists, on chrome-plated aluminum housings and not in the same place, and it is this particular problem — not gas sealing, fuel consumption, detail manufacturing or any of the others that have been so often quoted — that most troubles NSU now.

THE DEVELOPERS SPEAK

The comments following are abstracted from the SAE papers mentioned earlier, the first (*Continued on page 124*)

Factory Corvair claims first place in 1300-mile CANADIAN WINTER RALLY, edging out Ford Anglia by 7 seconds. Saab finishes third.

by Al Bochroch

► Thanks to our British Empire Motor Club neighbors, this year's Canadian Winter Rally can be classed in many respects with the great rallies of Europe. Run over the weekend of February 10, 11 and 12, the entry of 194 cars included a group of 24 top-flight stateside teams with Swedish champion Erik Carlsson and leading British navigator Stuart Turner lending an international touch. But it was the Corvair team, entered officially by the Chevrolet Division of General Motors, that provided the most pre-rally interest.

Here for the very first time G.M. was putting it on the line in a competitive motoring event. No hiding behind a dealer's skirts, no pattycake with a patron, just a simple straightforward entry, acknowledging a pride and interest in seeing how their three superbly prepared, well-driven machines would do against a strong field. Wonderful!

Well-known American rallyists were everywhere. Dick Smith, the 1960 American driver champion, replete with wired plug-in socks, was entered with Don Kirkpatrick in a hotted-up Team Roosevelt 600 Fiat. The ubiquitous VWs, 31 in number, were the most popular entry. Seven staunch Swedish Saabs, with Rover of Canada sponsoring the team (as Saab has no sales set-up in Canada) of Homer Trotter and Jim Bickham from the States, Peart and Locke, out of Montreal and Europeans Carlsson and Turner. Other popular entries were Volvo, 16; Morris 1000, nine; Hillman, 13; Triumph Herald, seven; Sprites, six; MGA, 11; Porsche, eight; Austin 850 Minis, 12; Morris Mini 850, seven; in all 40 makes with single entries ranging from an elegant Bentley to a sturdy Skoda.

Technical inspection was held at the local Rootes branch on the outskirts of Toronto, which also served as the Start-Finish line. Following the compulsory briefing sessions the Canadian press, radio and TV took over and as you wait in your car to climb the Mille Miglia-type starting ramp, Dunlop gives you a warm red hat, Renault a thermos of boullion, a pretty girl a kiss and you are up the ramp in the glare of the TV lights with Stirling's little sister, Pat, holding the Canadian Red Ensign to start you off. With close to 200 cars starting the 1300-mile junket, departure times ranged from 7 p.m. Friday until about 1:30 a.m. Saturday.

The first leg, a 785-mile stage run over a 24½-hour period, ranged northeastward by way of Perth, Bancroft and Huntsville to North Bay. Two 20-minute stops and one 1-hour stop eased the grind somewhat. The roads, mostly sharp-pitched icy hills, potholed dusty gravel, or hard-packed snow permitted absolutely no liberties. The driver who let up for a single moment found himself in trouble. Over half the entries were reported to have dug-out at least once during the rally. Average speeds ranged from the lower 30s to the mid 40s, except for a few terrifying sections over logging roads that went straight up knee-deep in snow only to plunge sharply downward into a series of impossibly tight turns. For these legs, three in all, the speeds were 28 or 29 mph.

Leading the field into the half-way mark were Carlsson and Turner in the Saab. Stuart Turner, who like all Europeans found the precise timing somewhat strange (they are permitted to come in ahead of time over there, if they can) said he thought the first half was "a piece of cake." Thirty-one starters had dropped out to this point and the organizers were complaining that the course was too easy. As you may suspect this report is brought to you from the questionable vantage point of a participant (and finisher) who did not agree with this viewpoint.

Having made North Bay after 24 straight hours on the road, each car had a compulsory nine-hour layover to eat a hot meal, to try to sleep and to work on the machine, but only to the limits of the classic *Parc Fermé* rally formula of gas, oil and tires.

Canadian Rally marked first victory of official General Motors factory team in competitive event. Factory cars sported fancy, double stripe.

Official starter Pat Moss (Stirling's sister) gives the go signal to the Carlsson-Turner Saab. Snow-choked route and hard driving eliminated many cars.

Nine hours later you've checked out and are on the way back through Western Ontario, 585 miles in 13-hours-plus with only a single 20-minute break. By this time the man and his machine have achieved a rapport, or chances are you've found a snow bank. The car's wild pitching over ruts large enough to swallow it are done with a brutal firmness, while the heart-stopping sliding turns which only the night before seemed always on the ragged edge are now nowhere near the limit and are brought off with an *élan* which only the punchdrunk can appreciate.

You've seen them fish a red Mini out of the ice, no-one hurt, and then the 403 that went over the snow bank, spun 60 feet down the hill to park squarely in the center of a barn, but without first opening the doors. And Roger Bohl, SCCA champion navigator this year, after falling asleep at the wheel and crashing, turned to ask his navigator why he let him doze off, only to find the navigator still asleep.

No report of this year's Canadian should pass without a word of praise for the organizers; instructions were clear and the distances given accurately in hundredths. There was no desire to lose the participant and instructions reflected the B.E.M.C. viewpoint that the rally should be a test of car and driver. Checkpoint organization was usually quite good. While there were about 45 controls in all, only the three designated as Time Controls carried the 20-minute stopover privilege. Route Controls where your book was stamped without time and Regularity Controls where time was noted had no layover and automatically started you on the next leg. Scoring was based on one point per minute early or late, except for a special section where timing was to the second. The latter was to be used only in case of ties.

The Corvair victory was not confirmed until two weeks after the Rally's finish. Provisional results had showed the Saab of Trotter-Bickham and the Anglia of Howell-Silvera leading. The Corvair of Dick Doyen, of Milwaukee, and Clay Gibbs of Menominee Falls, Wisconsin, appeared to have finished third. However, both the Corvair and Anglia teams filed protests, claiming they were not accurately timed.

The committee checked carefully and awarded first place to Doyen and Gibbs. Second went to Al Howell and Bill Silvera, of Toronto, who picked up a 7-second penalty in the regularity section, and third to the Saab of Homer Trotter of Watertown, N.Y., and J. E. Bickham of Upper Sandusky, Ohio, the winners of the 1959 event.

In a day when the majority of rallies run – at least in the United States – are strict arithmetic exercise, it's refreshing to find some that uphold the principle that rallies should be a test of cars and drivers in all kinds of conditions. We can only salute the B.E.M.C. for its role in maintaining the tradition. To the Competitors and G.M. in particular we'd add:

Brilliant performances all; see you next year! —*A.B.*

If on a midnight drive you're passed by a black RS-60 Porsche, take our advice: don't give chase.

the small warm black trophy

by david christie

● Every blonde, redhead or brunette that came into Mike Tramontine's apartment asked him the same question, whether they knew anything about sports car racing or not.

"Where did you win that little one in the middle?"

The trophy in the middle of his mantle was the unusual one. The two flanking it were much too imposing to arouse much interest after a quick glance at the ornate script engraved on their sides: 1st Place, Index of Performance at Le Mans and 1st Place Overall at Sebring.

The one in the middle was dull black and only five inches tall.

And warm to the touch, no matter what the temperature of the apartment.

And it smelled of burnt rubber and oil and hot concrete.

Approximately where it started was Riverside. He was leading the small-bore main event in his Mark XI Lotus when his head began imitating a V12 Ferrari running on seven cylinders. He managed to run out the race in fifth place. That time he blamed gas fumes in the cockpit for the headaches.

At Pomona it was the glare of the sun that gave him the jolting headache.

After Road America he went to a doctor.

As a wealthy man, he could afford the best. What he got was the worst.

". . . so you see, Mr. Tramontine," the Doctor said, his cold white office very far from the gasoline smell and noise of the track, "if I only had the opportunity to examine you sooner, there might have been a chance. Unfortunately . . ."

Everything was finished that night. He sat there in the dark, alone in the silence. He formulated his last ride, a race the next month at Lime Rock. He knew just what turn he would take a little too fast and right where the car would end up.

"Better that than the slow way," he thought. The clock was striking twelve when the phone rang.

"Hello . . . yes, this Tramontine. (suddenly the palms of his hands felt moist) I'm afraid I don't understand."

The room seemed to freeze and the clock on the wall stopped.

"What exactly would be the stakes? Yes, of course. Stupid of me to ask. (he smiled at that) And what will you be driving? Oh. (there was a long pause and Tramontine's breathing was the only sound in the world) Very well, I accept."

The moment he replaced the receiver, the clock began ticking and the sounds of the city re-entered the apartment. He dialed a number.

"Hello? Jim? I'm glad I caught you. Is the car ready for a drive? . . . a race. I know it's short notice but I just found out about it myself. A match race. If everything else checks out how about gassing her up and I'll see you in about an hour. 'Bye. What? No I don't know what he'll be driving, he just said something suitable for the competition."

The night was unusually hot, even for Los Angeles. Tramontine was wringing wet by the time he got to the garage in the valley where he kept his competition cars. No one was around when he let himself in and turned on the lights. He left the wide doors open and walked over to his machine.

It was an almost new, fantastically beautiful Mark XIX Lotus Monte Carlo, white with one red stripe across the hood.

He put on his white helmet and goggles, started the car and nosed it out into the strangely deserted streets. Five minutes later he was driving on the Hollywood Freeway.

There was not another car in sight.

He slowed and let the car roll to a stop, letting the engine idle. The heat surrounded the car like the folds of a curtain. Then he saw the lights in his mirror. It didn't take long for the car to brake to a stop beside him.

It was an RS-60 Porsche, painted black. The lights on the dash and the headlights seemed to be tinted red and the engine sounded like a thousand lost souls.

There was no driver.

Tramontine adjusted his goggles and made a final check of the instrument panel. He shifted into first and the two cars screamed away. They left four black marks on the pavement that are still there.

The straight white line of the freeway seemed to stretch on forever, both cars accelerating side by side. They were doing 140 when the road suddenly changed into the esses going into Arnage corner at Le Mans. Tramontine felt more at home here. He was ahead by a car length through White House and under the Dunlop bridge. With the Porsche off his left rear fender, the grandstands dissolved into the trees lining the Nurburgring.

The Porsche came abreast in the downhill curves and made the Lotus fight to stay on the road.

"It must be psychological," he thought as the German car slowly inched ahead. The black car seemed to carry its own envelope of suffocating heat and the engine at speed was a maddening thing to hear.

They went into Turn Six at Sebring hub cap to hub cap. Around the flat concrete the Porsche matched him shift for shift, neither one giving an inch. The little black car made Tramontine mad. Porsches had always made him mad.

Porsche drivers even more.

The straight merged into the hard right Turn One at Santa Barbara. Tramontine knew this was the last lap. This was where he had won his first race and started his life of living on the thin margin of rubber and steel. He went into Turn Two with no illusions. The Porsche swerved and tried to run him into the telephone pole and wire fencing. In the hundredth of a second that it took him to downshift and accelerate out of the trap he knew what he would do.

Down the straight he kept the Lotus wide and watched out of the corner of his eye as the Porsche inched almost abreast of him. Into the turn, the Lotus seemed to fishtail and hinted at a spinout. The Porsche started through on the inside. He never made it.

Tramontine jammed the gas pedal to the floor and prayed. He shoved his right front tire onto the grass and cut the corner as close as any man could.

The Porsche was into the corner too far and too fast to back off, but he tried. The only place to go was through the snow fencing and into the ditch. Tramontine came out of the corner onto the Santa Ana Freeway, headed home with a cool breeze and the sound of the Lotus in his ears.

"Porsche drivers are like that," he told the Lotus.

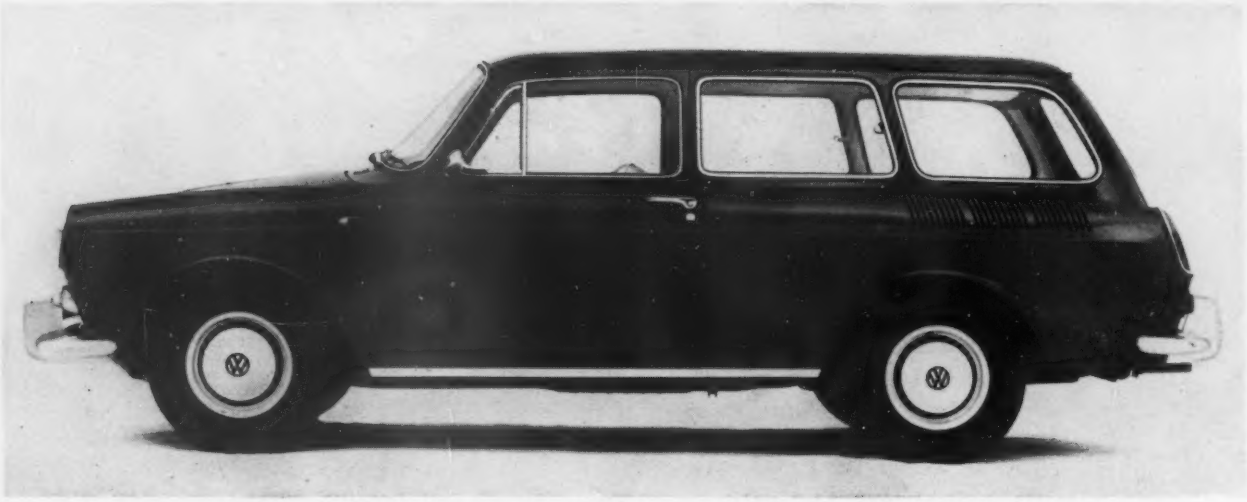
The next day the mailman brought the small package. There was no return address on it.

When Tramontine unwrapped the box and took the trophy out, the metal seared his fingertips. The scars were still there when he won his first Grand Prix six months later.

And the trophy was still warm to the touch when the blonde under contract to MGM asked him where he won it.

"That is a very long story, Doll," he said, steering her back to the couch, "and I'm sure you don't want to hear any long stories now."

Only later did he add with a smile, "they say Fangio has one."



Radically styled for a Volkswagen, the VW-1500 line includes a trim two-door station wagon with very Corvair-ish intake vents on the rear fenders.

BIGGER BEETLE!

Not at all beetle-shaped, the VW-1500 with its greater power and standard four-speed synchro transmission may be a true "poor man's Porsche."

► The long-awaited, bigger, faster, more powerful Volkswagen will make its debut at the Frankfurt auto show in September, but don't rush to your dealer to order one — they won't be marketed here for some time.

Based on what is essentially the '61 chassis, the VW-1500 has a 1493 cc engine, giving it a top speed of about 87 mph. Naturally it's rear-mounted and air-cooled, but none of its parts are interchangeable with the current power unit. Despite having a larger displacement and more power (about 54 bhp compared to 40 in the '61s) the 1500 engine is said to have smaller outside dimensions. This is apparently accomplished by switching to a horizontal blower unit and mounting the engine under the floor of the externally-accessible rear trunk. Using the same bore/stroke ratio of the current VW, the probable bore and stroke figures for the 1500 are 83 x 69 mm which results in exactly 1493 cc. It would appear that the change in the '61 engines—to a larger center-to-center distance between the cylinders — would permit VW to bore out the present block to accommodate larger cylinders for the new engine.

Initially — and only in Europe where it's expected to meet car demands of a growing middle class — the car will be offered in two-door sedan and station wagon styles, with four-door models coming later. VW enthusiasts may mourn the departure from the familiar beetle shape, but the new body should provide more trunk space, both front and rear, and more rear seat head-room. The present car will *not* be discontinued, VW spokesmen emphasized. While a new assembly line has been added to build the new cars, daily production of 4000 standard VWs will go on indefinitely.

One likely reason for VW's reluctance to introduce the 1500 outside of Europe is the company's insistence that service and parts facilities everywhere be the best possible. To instruct mechanics in servicing the new cars and to provide the required volume of spare parts in Europe alone will require near-Herculean effort. And VW is not likely to ignore the over four million regular VW owners around the world. There is really no immediate reason why the 1500 should be introduced outside of Europe. For the majority of buyers, even if the 1500 were introduced here, the standard car would still meet their needs. —*C/D*

The new VW-1500 sedan is 166.2 inches long overall, six more than formerly. The air intake consists of a row of louvers below the back window.

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LIVING ROOM LIME ROCK

Continued from page 65

as you can utilize a pan-type frame, and you will probably want to buy a Strombecker kit just to get wheels, tires and other goodies anyway. Motors are sold separately for 79¢ (!) pickups for 98¢ and gears (a set of three ratios, 2 to one, 3 to one and 4 to one) for 39¢, but you have to purchase a kit to get the steering setup. Having one of these in your hand as you work will help you copy the principle in metal. 1/32-inch sheet brass, a drill, soldering iron and some small rivets or bolts are required to fabricate the steering. Some builders pivot a beam front axle on the guide peg or shoe, but this is not so realistic or satisfactory as the Ackermann idea.

If you go the Scalextric track route and build nonsteering cars, a Scalextric guide pin, pickup and wiring harness can be purchased. Other Scalextric parts worth considering are the Triang motors and the rear end gears. Two types of Pittman or Mantua model train (HO gauge) motors are stocked by most hobby shops ($6.95 to $8.50). One has a built-in reduction gear and ends in a cross-shaft quite suited to model cars. The other is a straight-shaft type requiring bevel gears or pinion and side-cut gears to transmit the motion around a corner. Several toy cars of the inertia type have gears in the right ratio and it is worthwhile to cannibalize them if the Strombecker nylon cogs won't suit your purpose. High-quality metal gears with setscrews are made by Model Racing Cars Ltd., 29 Ashley Road, Bascombe, Hants., England for the real enthusiast.

Should you not find a Merit model that appeals to your sporting instincts, Scale Model Equipment Co., another British concern, markets "solid model" kits in this country which are worth having for their detailed plans and beautiful 23 mm and 26 mm rubber-tired wheels. Mercedes W125, E.R.A. E-type and 159 Alfa are among the offerings. By hollowing out the solid body and fitting it to a pan-type frame with a hefty Pittman motor and metal gears, you will have an optimum racer in 1/32 scale. If you are any sort of a crafter you can probably carve other bodies and utilize the chassis/running gear suited to the Alfa, let's say, for early Maseratis, Millers, Duesenbergs, etc.

Indy cars in the scale field are represented by Monogram's electric job which needs only a hole in the belly pan to permit mounting of a pickup. The Monogram car has bigger tires than the Strombecker cars but the same-diameter wheel, so it is possible to mount the front tires from the Indy car on the back wheels of the Scarab for more bite and a different gear ratio.

Even though cars are turned out by the gross in identical shape, each poses its own handling problem and the change in gearing, rubber or shift-in-weight practices by builders of full-sized prototypes can be followed in scale. The Strombecker Mercedes, for instance, is a pig until you put a couple of pennies in the nose. And the first thing we used to do with the old-style Scalextric was begin carving the lead weight.

One incidential point: it is a cool idea to install TV interference suppressors in the models. Scalextric cars are already equipped and you can buy the tiny condensers at hobby stores who handle model railroad equipment in any quantity. The suppressors do not change performance but they do prevent protests from other members of the household who have a less avid interest.

As your interest develops — and it will as you spend pleasant hours at the workbench or hunched over the track — expanding the layout or improving its appearance will be the next step. An initial modification to either Strombecker or Scalextric track lies in adding some safety zones to the curves. A piece of ⅜-inch plywood sawn to match the outer diameter of a curve and extending the track area by about 3 or 4 inches at the apex will prevent the loss of many a driver and add lots of thrills. The critical track width, particularly with 1/24-scale cars, prevents the driver on the outside of the turn from hanging the rear end out as far as he otherwise might when threatened by the inside car. Adding the apron gives enough more maneuvering room to put a premium on extra skill and, at the same time, does not keep the unskilled from getting out into the boondocks.

With Scalextric's multiple-lane curves now on the market, the two-car track will no longer satisfy the hobbyist and even though he may base his layout on the Strombecker track, which as yet has no provision for more than two cars at a time, he can duplicate small sections of it in plywood to allow a larger starting field. Since the track pieces are symmetrical, they can be bandsawed down the middle for one more lane, (on the straightaways, that is) or laid side-by-side for two additional cars. The larger radii needed on the turns can be kept in the same proportion, as ⅜-inch plywood is cut to match, or you can bring the two slots closer together to make a "line" through the turn which forces one driver to give way.

Club installations here and abroad compare favorably with model rail layouts in miniature realism. Landscaping, pit details, scale-size mechanics, even spectators decorate the courses which run from 50 feet to 80 feet per lap in length. The individual can add atmosphere to his smaller setup with accessories available from Scalextric such as oil drums, hay bales, racing pits (with changeable car name boards), control tower, grandstand, track signs, p.a. speakers, start-finish banner, etc. Tiny rubber cones, visible in some of the photos, were whittled out of balsa one evening by Doug Stewart (who also took most of the photos). Shut-off markers, flags and other racing "color" are simple, realistic touches.

Scalextric has added a hump-backed bridge and some track banking equipment which helps to reproduce road and track conditions. The bumpy bridge will send your car right off the paving if taken at full tilt, but the banking permits "sweeping" turns to be intermingled with slow curves.

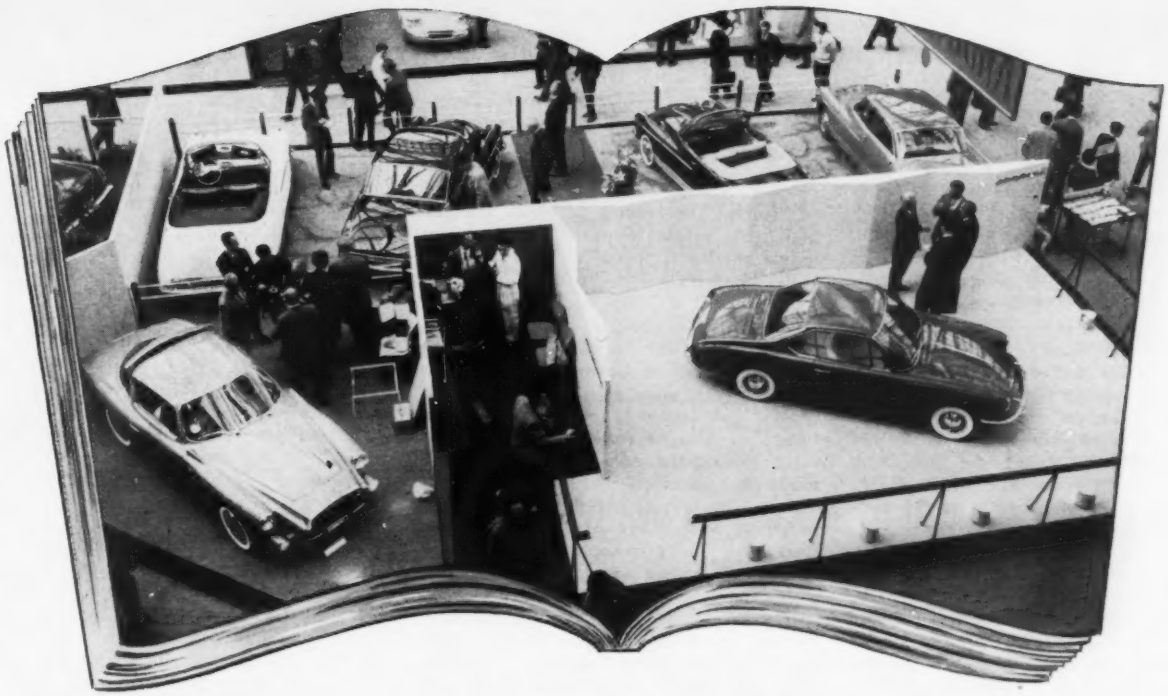
Of course after you have built up a Scuderia, or even one car, for that matter, you'll need a truck and trailer. Fortunately SMP's 1/25-scale Ford, Chevrolet truck and El Camino kits, complete with car-trailer and tool box, are widely distributed. Building and painting one of these units is good for a couple more evenings plus lots of compliments from friends who don't know what wonderful things the kids of today have to play with.

You can go as far as you like into the addition of detail and building realism if you have a room or garage to devote to building a track. Once your acquaintances have tasted the thrills of competition you can get lots of assistance. If you do get involved in this sort of group activity, however, it would be a good idea to write to Tom Cook, 160 Ridgewood, Kalamazoo, Mich., Secretary of the KVMAC, and get their rules.

Whether you get carried away to this extent or not, scale model racing can fill many an evening with excitement and provide an outlet for your competitive urges.

And the grand part about the whole thing: to date nobody, driver, spectator or crewman, has suffered any injury! Which is fortunate, really, because no manufacturer is currently building a scale model ambulance. —*OCR*

"Marge! Who's home watching the kids?



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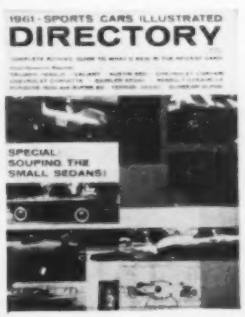

ARE 4 WHEELS 2 TOO MANY?

Continued from page 45

at the same rate. The amplitude, or travel, of the oscillation gradually increases as the gyro slows down until the car eventually flops over on its side. I would estimate the gyro speed at this point as perhaps 1/10th of the maximum speed. And get this also: when Tremulis locked the gyro on its gimbal axis, wound the gyro up to speed, and set it down on the table – the thing just flopped right over on its side. Even though you can't detect the stabilizing oscillations with your eye, they're very much there – and you *must* have this two-axis freedom to stabilize with the gyro.

NOTHING NEW UNDER THE SUN

The properties of the gyroscope were first discovered by the French physicist, Jean Foucault, in 1851. It is not thought that he had any practical application in mind at the time. The first recorded application of a gyroscope used to stabilize a vehicle was in the field of monorail trains. In this case the single rail is laid on the surface of the ground; the gyro does the stabilizing, with no auxiliary balancing rails or overhead suspensions necessary. An Irishman, Louis Brennan, started experimenting with gyro-stabilized monorails before the turn of the century. He took out his first patents in 1903, and demonstrated his first full-size working model – a small 17-foot car – in Berlin in 1909. A year later he developed a more efficient 40-foot car with 80 bhp and a speed of 22 mph. This one had two 42-inch, 1700-pound gyro wheels rotating at 3000 rpm in opposite directions at opposite ends of the car. The major gyro axes were placed horizontally across the car, with the precession or gimbal axes vertical – to simplify the bearing problem.

Brennan's monorail train caused quite a sensation in the scientific world in 1910. There were a number of other attempts to develop practical gyro-stabilized monorails in the years before World War I, but no commercial line ever went into operation. Lack of knowledge of gyro characteristics – evidenced in jerky stabilization on curves and grades – apparently kept anybody from going overboard for monorail trains, not to mention the bearing problems and the high gyro weights required with the low usable rotational speeds in those days.

But apparently Mr. Brennan's early-century monorail activities were not going unnoticed in the automotive field. As early as 1903 American car designer James Scripps Booth was on the drawing board with a revolutionary two-wheel, three-seat car to replace what looked to him like the limited future of the four-wheel layout. Those early drawings showed a gyroscope stabilizer mechanism under the rear seat, driven by a V-belt from the transmission. When the prototype was finally completed in 1913, there was no gyroscope. Contemporary technical literature mentions the "cumbersome, complex gyro mechanism", lack of "pleasant leaning" on a curve, as reasons for not pursuing the gyro theme. The prototype was driven just like a motorcycle, and had lever-operated retractable dollies (each with two 15-inch wheels) on each side for balancing when the car was driven at very low speed or stopped.

Even without the gyro, Scripps Booth's "Bi-Autogo" was a weird machine, for that day or any day. It had one of the first V8 engines in the industry – a 385-cubic-inch job that featured articulated connecting rods, aluminum crankcase, and a unique compressed air starting system. It was rated at 45 horsepower. The radiator was a problem, with the single front wheel at the nose of the body. They ended up with 450 feet of ½-inch copper tubing draped around the engine compartment. A 4-speed aluminum transmission with a separate oil pump for gear lubrication was under the driver's seat. The car was laid out on a 140-inch wheelbase and weighed about 4300 pounds at the curb.

This was the only two-wheel car built in this country up to the present. It never went into production. Steering was very heavy, due to the large front caster angle (turning required lifting the heavy engine) and lowering and retracting the side wheels with the ratchet mechanism was quite a chore. Scripps Booth quickly lost faith in the concept after the car was built and tested. He went back to four-wheel cars, the gyroscope disappeared into the aircraft and marine fields . . . and we didn't see any more of this interesting principle of land locomotion until Ford's recent announcement.

The history of this latest project can be traced back to 1952, when Alex Tremulis – then a stylist with Kaiser-Frazer – presented the idea of a gyro-stabilized two-wheel car in an S.A.E. paper on future car designs. Some time after he went to Ford in 1954 he built up this small 15-inch model with a gyro from a surplus aircraft instrument. After a few demonstrations it wasn't long before there was enough interest around Ford Styling to pry out some funds for full-scale work. The general delta body shape had interested Ford stylists for some time; they were looking for some way to apply it to a reasonably practical car. The usual four-wheel rectangular planform was no answer; a three-wheel diamond layout would fit nicely, but would (they felt) lack stability on the road. Tremulis's two-wheel gyro-stabilized deal looked like the ideal answer for a new dream car based on the delta body shape. ("Forcing function to conform to shape" is what they call it – and the Ford people admit they've never had to force function quite so far before!)

The first stop was over at Ford Engineering to see how much of a gyro it would take to do the job in a full-scale model of around 2000 pounds. The early monorail cars had used gyros that weighed roughly 5 percent of the total car weight, which wasn't too encouraging. But they were turning at relatively low speeds, of course, because of metallurgy and bearing problems. Ford engineers figured that by turning the gyro wheel up around 20,000 rpm, they could do the job with a weight of roughly 25 pounds and a wheel diameter

of 24 to 30 inches. (Keep in mind that a gyro wheel functions on the same principle as an engine flywheel. For similar shapes the rotational inertia is directly proportional to the weight of the wheel — but increases as the *square* of the diameter. In other words it's much more profitable to increase the size than the weight. If, say, a 24-inch gyro will do a given job with 25 pounds of mass, by increasing diameter to 36 inches you could do the same job with only 11 pounds of mass. So it's always a problem of compromising between size and weight in gyro design.)

Now that the Ford stylists knew that their dream car could be stablilized with a gyro of reasonable size and weight they took the problem over to the missile engineers at Ford's AeroNeutronics division. What could they supply? The answer to this one just about stopped the project cold right there. No commercial gyro units were available in this general size and weight — and it would cost $35,000 of hard budget money to design and build a special unit to do the job! The AeroNeutronics boys were very interested, even willing to donate some of the work on evenings and weekends, but that was the least they could do it for.

So this is why Ford's Gyron doesn't have a gyro. The full-scale mock-up alone ran close to $100,000 (people not close to this type of work have no idea what these dream cars cost at Detroit labor rates); Ford management couldn't see the extra money for the gyro at this time. A secondary consideration here was the powerplant. You can't put the engine between the front or rear wheels on a two-wheel car. With the 110-inch wheelbase and compact dimensions used for the Gyron delta design there were no available commercial power units that gave enough horsepower per cubic foot of bulk to give adequate road performance. (This is apt to remain a problem for a long time with two-wheel cars; a practical design may have to wait on fuel cell or nuclear powerplants, or the Wankel engine.) Anyway the Ford people figured there was no use spending money for a gyro unless there was an available engine to move the car.

LET'S SPECULATE A LITTLE

The Gyron is 86 inches wide and 45 inches high. I'll estimate the frontal area at 17 square feet and the Cw factor at about 0.25 (the Porsche coupe has a Cw near 0.30 — and Gyron is a lot cleaner underneath and on the sides). Using these wind drag figures and assuming standard road tires at 35 psi inflation, the Gyron should be able to go 100 mph with only 40 bhp at the flywheel. A road speed of 150 mph would take about 175 bph. Wind tunnel tests on this type of delta shape show excellent aerodynamic stability, so it should be rock steady to these high speeds in crosswinds.

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The matter of cornering is a little harder to nail down. Obviously very little is known about the roadability of two-wheel gyro-stabilized vehicles. Tremulis's model has no drive power, so is not adapted to constant-speed tests on a curved path. We have to go pretty much on theory. When a motorcycle is driven on a curved path it automatically assumes a bank angle that is mathematically related to the centrifugal "g" force. The tangent of the angle of bank equals the centrifugal g's. For instance a speed of 25 mph on a 75-foot-radius turn would generate 0.56 g of centrifugal force (0.56 × weight of the machine). This 0.56 is the tangent of an angle of about 29 degrees — which would be the angle of bank. A two-wheel machine would not be stable at any other bank angle under these conditions.

Same with our gyro car. But the gyro is going to resist any sudden tilting of the body into the bank angle. The answer is *forced precession*. If we hook up a hydraulic linkage, or some such, that will forceably tilt the gyro about the gimbal axis in a direction *opposite* to the way it would tilt in normal stabilizing, we can bank the car into a turn just as neat as you please. In other words the car can be made to roll from side to side by merely tilting the gyro about the gimbal axis inside the car. Of course this forced precession would require a small auxiliary gyro mounted somewhere on the car that could sense minute directional changes, and telegraph them to the precession forcing mechanism. Some of the old monorail trains used a pendulum arrangement and cumbersome compressed-air power equipment to do this. The problem should be relatively simple with our modern knowledge of gyrodynamics and servomechanisms.

Actually the small auxiliary gyro would be necessary anyway, even if the car always traveled in a straight line. The restoring moment of a gyro mechanism is proportional to the angular velocity of tilt. Just a small, steady force on one side of the car will eventually tip it over because the tilt velocity is minute, and the stabilizing moment is correspondingly minute. This is why gyros in aircraft "drift". It's not a 100 percent efficient mechanism; a gyro has to be continuously compensated.

But if we can learn to live with this fascinating little gimmick — learn to apply its principle in light, compact and economical ways — it could be that someday the gyroscope may be nearly as important on the land as it is now in the air. Ford has scratched the surface of the surface. Tremulis and his friends may be reminding us 20 years from now that they figured four wheels were two too many! —*RH*

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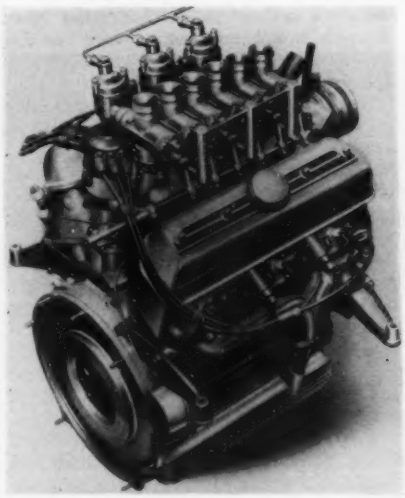
V6

Continued from page 87

a "secondary harmonic" component here (which I won't even try to explain) causes an unbalanced rocking couple that rotates at twice crank speed. In other words unbalanced forces at the ends of the crank act in opposite directions, vertically, at a frequency of twice crank speed — so they would tend to rock the engine fore-and-aft on its mounts. They could be balanced, of course, by having an auxiliary shaft above or below the crankshaft, running at twice crank speed, with suitable counterweights.

But here's the gimmick: it has always been known that the magnitude of the secondary harmonic of the reciprocating inertia force is only about ¼ that of the primary component (and higher harmonics are negligible). On paper this still looks formidable, as the peak primary component on a modern big engine at 4000 rpm can go to 2000 pounds or more. These secondary magnitudes of 500 pounds or so had our engineers worried for a long time. They didn't see how an engine could possibly be smooth with this much unbalance — even allowing for very flexible motor mounts. Even after Vittorio Jano built the 1950 Lancia without any special balancing means (and don't think our makers weren't quick to wring out this engine on their dynamometers) they weren't satisfied. The auxiliary twice-crank-speed balance shaft looked like a must, and, of course, the extra cost of this was a big, black mark against the V6 layout as a whole.

What finally cracked the deal was the thorough analysis made by G.M. Truck and Coach engineers. They just about *had* to use the V6 layout to get the tooling economy and part interchangeability they wanted for their new engine series, so they carried their paper analysis a lot farther than earlier investigations. They didn't stop with a seemingly-formidable unbalanced force magnitude; they went ahead and calculated the actual *linear deflection* that this unbalance would cause if the engine were suspended freely in space when running at rated rpm. (No, we can't say the new electronic brains were the factor that made it all possible, but the equations certainly were not simple!) Anyway the slide-rule boys came up with what looked like an impossibly-small figure for the vertical deflection — only one-and-one-half thousandths of an inch! Nobody would believe it. The secret, of course, was that the great fore-and-aft inertia (or flywheel effect) of the engine-transmission unit absorbed those few-hundred pounds of unbalance easily. Just to make sure they weren't dreaming, the engineers set up a test rig where the engine was cradled on large air bellows; these had practically zero spring rate and gave the same effect as if the engine were running suspended in space. Strain gauge readings confirmed the slide-rule analysis — around 0.0015-inch vertical deflection at rated speed!



By fitting six carbs atop this early Lancia V6, Enrico Nardi extracted 22 more horses.

That did it. Overnight the old balance bugaboo on the V6 layout was wiped out. It suddenly became practical for mass-produced American passenger cars. The research departments took new interest right away. And here we are today. It will be just a matter of time — perhaps 18 months to two years — before Detroit will have V6s on the auto production lines. We'll see more of them in trucks and other commercial applications where space, weight or cost problems make them practical. We could see more of them in racing. Time will tell.

—RH

CALL HIM JOE

Continued from page 51

years how would I know what I wanted to be? It's quite strange."

In his teens, Bonnier discovered the simple fact that is responsible for all racers: "I like to go fast." In 1946, when he was 16, this was accomplished on a Harley-Davidson motorcycle, vintage 1924. Bonnier took it apart, added racing carburetors, lightened it and not only put it back together but made it go faster. With automobiles relatively expensive, motorcycling is much more widespread and socially acceptable in Scandanavia than in the United States — it has few of the black leather jacket, "Wild Ones" connotations. Bonnier and his friends raced each other and attended organized competitions, but as exuberant young men, not as dedicated motoring enthusiasts. It wasn't until he was 18 that he bothered to see his first automobile race and he wasn't overly impressed.

The next year he finished *gymnasium*, a three-year portion of schooling which in chronology approximates American high school but in course material is comparable to our junior college. Entrance is by difficult examinations and a small proportion of Scandinavian children finish the three years. A much smaller number carry their education beyond that point and those who enter a university are usually preparing for a profession such as law or medicine. The prominent Bonnier family — professors rank much higher, socially and economically, in Europe than they do in the U.S. — had wanted Joakim to be a doctor. But, he says, "I got very bad marks. That was a good thing because it would have been a mistake for me to be a doctor. It didn't interest me and I don't think you do anything well unless it interests you."

So at the age of 20 Bonnier was apprenticed out to learn the publishing business, with a view to entering the family firm. Things could have been worse; the site of the apprenticeship was Paris where he worked on the business side of N.M.P.P., a huge newspaper and magazine company. The dashing young Swede grew a beard and had a generally delightful time. "I don't like Paris much now," he says, "but I loved it then. I was young and there was so much to do. And," he adds with a knowing smile, "I had that MG and that helped a lot." The helpful MG went up the spout one night when a French jeep abruptly turned in front of it. "The soldier said he was looking at a girl and didn't even see us. It turned out he wasn't supposed to be there. The Army bought me a Simca 8, I wasn't hurt and they sent my friend to the Riviera for a month to recuperate. It didn't turn out so bad after all."

With a year and a half of Paris under his belt and the keys to the new Simca in his hand, Bonnier returned to Sweden to do his time in the service. Rather than spend a year in the Army he volunteered for the Navy and received a commission. Under this arrangement he has now spent a total of two and a half years in uniform, six months at a time, and was recently promoted to lieutenant.

In the spring of 1952 he finished his first Navy stretch and, "To my parents' horror I started a used car business with a friend of mine. This was the way I came in contact with motor racing. I wouldn't have been a driver unless I'd started that business." Soon Bonnier bought out his friend and began getting acquainted with motor sport. The acquaintanceship proved greatly to Bonnier's advantage but, had his customers known its method, they most assuredly would have taken their business elsewhere. "I'd buy a car on Saturday afternoon," Bonnier says, still looking a trifle guilty, "race it that night and early Sunday morning and then sell it on Monday. It didn't do the cars any good. We'd go on what we called Black Road Rallies because the bad roads on Swedish maps are black lines. That's where I got my early training. The rallies were really races because you had an impossible average speed to maintain. It was like having a race on roads you don't know. And of course they were mostly at night."

This hardy fare developed in Bonnier a taste he still favors. "The Mille Miglia was the greatest race. Now that it's gone I prefer the Targa Florio. It's a true road race. You couldn't possibly learn a road circuit perfectly." Bonnier, like Taruffi and Brooks, loves the improvisation of open road racing and wishes motor sport had remained true to its ancient principles. "I hate those flat things where you go around hay bales or rubber cones or barrels. The Nürburgring is a wonderful circuit. I love it. After they used the short circuit this year a lot of the drivers complained, but it's still much better than those British courses like Silverstone."

Despite his penchant for giving his merchandise a severe workout, Bonnier's used car business was very profitable. In 1954 he bought a company that had folded, taking with it the Swedish Alfa Romeo distributorship. The Alfa charter seemed of dubious value; at the time there were "maybe 15 cars in the entire country and nobody in Sweden knew Alfa." Looking for a little publicity he entered a 2-liter Alfa in the Swedish Grand Prix. "I'd had a couple of little races before but I usually call that my first real race. Even today I frighten myself when I think about it. I was more on two wheels than four. After practice Prince Bertil — you know he was quite an enthusiast — came up and said, 'We appreciate that you're so keen on it, but really, you've got to slow down.'

"It was a Le Mans start and I left the car in first gear because I thought that was the thing to do. Just minutes before the start I was told that wasn't legal. I ran over to put it in neutral and," says Joe with a shake of his head, "of course I put it in reverse. When they started the race I jumped in the car, started the engine and the car zoomed backwards through the pits and into some woods. I finally got going and caught up and finished third. I would have finished second if I hadn't goofed."

Any man deserves a rest after that sort of debut and Joe took it. He founded the Swedish Racing Drivers Club, which didn't hurt Alfa's corporate image, and buckled down to the job at hand. At the end of the year he had built up a dealer network and sold 170 Alfas, a figure he and the factory quite rightly considered "fantastic." He made several trips to the Alfa factory in Milan where he spied the *Disco Volante* in which Fangio had fallen from the lead to only second in the 1953 Mille Miglia after having lost the steering to one wheel (see SCI, February, 1961). Bonnier began dropping hints about what a nice reward the car would be for the factory's aggressive new Swedish distributor. Give its pride and joy to Reverse-Start Bonnier? "Nothing doing." Bonnier kept wheedling.

The 1955 season, the year he became a racing driver, opened for Bonnier and a friend at the Mille Miglia in a 1900 TI Alfa outfitted with everything but a fox tail and an automatic victory clincher. But the big news was that the factory had given in; the *Disco Volante* was Bonnier's. There was much head-shaking and not a little mumbling as Bonnier and the car were packed off to the Finnish Grand Prix. This was 3.5 liters of potent racing car, not a 1900 TI. It must be handled with prudence. *Piano, piano, Signore Bonnier.* Friends at the race played variations on the same theme. "I won the G.T. race but before the sports race people kept telling me to be careful, the *Disco* was quite another sort of thing. I kept saying, 'Sure, sure, I know it's different.' I started and went beautifully. I was 'way ahead. On the fifth lap I broke the record and on the sixth lap I smacked into a tree. It ruined the car. I sent it back to Milan and of course they all said, 'I told you so.' "

From that low point Joe moved on to the Swedish Grand Prix, "Sort of a turning point for me. Mercedes was there with Fangio and Moss. All the good drivers were there, Behra, Castellotti, all of them. I raced in the 2-liter event. There weren't any big stars but there were some pretty good drivers. I won it after a hell of a fight. That got me an invitation to Oulton Park. I drove a 1900 TI in the production car race. I just got off to a hell of a start and ran away from the lot. They'd fixed up the *Disco* and I ran it in the sports race but the tank split. The next race was the Stockholm Grand Prix. That was the first time I'd run the *Disco* properly. I won and that got me an invitation to the Tourist Trophy at Dundrod. I drove a Maserati with Andrea Loens and we won the 2-liter class.

"After the Swedish Grand Prix I started thinking more and more of making it a career. I contacted Stirling and he was very helpful. I told him I wanted a little sports car. He recommended a 1500 Maserati. I bought it and sold the company." Some people would think it astonishing that with a rocky road ahead in racing, Bonnier would dump a lucrative business. But to Joe, "It was fun organizing the dealers and all that. It was a real challenge. But I don't enjoy selling. I don't get any enjoyment out of talking somebody out of an extra $1,000. It just doesn't interest me."

Bonnier's first year as a professional driver was 1956. "I bought an old bus, I guess I paid about $400 for it. MacKay Fraser — he had a Ferrari Monza — went along. We were like gypsies. I had more fun that year than I've ever had since.

Sometimes we'd just sleep in the bus beside the road. The bus was always breaking. We welded it and welded it. I had a mechanic who had worked for my company. We just lived on starting money. We never did too well but I did well enough to be recognized by [Nello] Ugolini [Maserati team manager]. I got a sports contract for '57 and drove a few races for them at the end of '56.

"My first Formula 1 race was the Italian G.P. in September, '56. I was there for the G.T. race in the morning. About an hour before the G.P. Ugolini came up to me and said, 'Where have you been?' I said, 'Right here.' He said, 'I've been looking for you. Villoresi is sick. You must drive one of the Grand Prix cars.' I said, 'You must be mad. I've never been in one. I wouldn't know how to start it.' Ugolini said, 'Villoresi will start and then you will take over.' It was quite an experience. They used the banking then and I was petrified most of the time. I wasn't used to it at all. I thought it was very strange to see the wheels go around and I thought it handled very peculiarly. Fortunately something was wrong with the car and it finally stopped."

At the beginning of 1955 Joe was racing for publicity and kicks. At the end of 1956 it was fast becoming his life. This and his carefree attitude were evident in his reaction to a serious shunt in the middle of 1956. "I broke a vertebra and the doctor said I would be in plaster for six months. My brother-in-law is a doctor and he said he would take off the plaster if I would promise not to drive even a passenger car. The next day I flew to Rome and drove up to Imola. I was in three one-hour races and won the G.T. race. I don't know why I did that. If something like that accident happened today I'd probably quit."

During 1957 Joe drove a factory Maserati sports car and a Formula 1 Maserati for Scuderia Centro Sud. Nothing spectacular in the way of victories occurred but, again, there was a spectacular mishap. Bonnier survived Caracas; Scuderia Maserati did not. The season that had started so full of promise for the factory ended in Venezuela in the flames and debris of all the best 450S sports cars. Joe describes his role in the debacle: "I blew a tire and Harry [Schell] hit me. His car jumped a wall and burst into flames. My car went down the road, all the time spinning and hitting one thing after another. I kept ducking my head up and down and once I saw a puff of smoke in the mirror. I thought the car had caught fire so I jumped out. Just as I hit the ground the car smashed into a cast-iron lamp pole. The pole broke off and fell across the cockpit. It turned out what I'd thought was smoke was just a cloud of dust. That mistake saved my life."

Maserati's withdrawal from racing left Bonnier high and dry for the 1958 season. He had been approached by B.R.M. but had turned down the offer, confident of a seat in a Formula 1 Maserati. By the time the seat was burned out from under him, B.R.M. had signed Behra and Schell. So Joe bought an old Formula 1 Maserati and signed with Borgward for sports cars, who "had a fine car but they wouldn't spend any money on it." The season saw a few minor victories, a number of seconds and

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(*Continued from page 115*)

rides in a spare B.R.M. in the concluding Grand Prix at Monza and Casablanca. The Moroccan G.P. was notable not only for the clear picture drawn of Bonnier's mechanical limitations. His fourth place earned him his first driving championship points, the first such points ever won by a Swede.

During both 1959 and last season he drove Formula 1 for B.R.M. and sports cars for Porsche. The contrast between the two firms was instructive. During his days with Borgward, Bonnier learned that in motor racing money must be spent; with B.R.M. he learned that the expenditure of money is not enough — "The company must be hungry." B.R.M. is assuredly hungry for success but definitely not for financial backing; it is one of more than 20 firms controlled by Alfred Owen, one of Britain's biggest industrialists. "If you want to go motor racing," says Bonnier, "you must have research and you must have a reason. Porsche has a reason; its successes are important to the sale of its cars. B.R.M. doesn't have a reason and it shows up in the way it does things."

To this date B.R.M. has only one championship Grand Prix victory to balance the books against years of effort and millions of pounds spent first to wrest construction supremacy from the Italians and the Germans and later, when Vanwall and Cooper made that aim superfluous, to justify the organization's efforts and ideas. The lone triumph was supplied by Bonnier and came at perhaps the firm's darkest hour. Shortly before the 1959 Grand Prix of the Netherlands, Alfred Moss and Ken Gregory had received, more or less gratis, a B.R.M. for the British Racing Partnership stable. As Jesse Alexander remarked, it was about as resounding a vote of no-confidence as one could imagine.

With B.R.M.'s fortunes all but down the drain, Bonnier won at Zandvoort. In retrospect Bonnier isn't overwhelmed and he didn't seem so at the time. "Personally, I don't consider that as a big effort. I just got in the car and went around and around and I won. Everything went perfectly." But the tears in the eyes of the pit crew and the whoops that followed indicated it meant a very great deal to the boys from Bourne. Everything working perfectly was, and is, a stupendous event for them.

Bonnier's easy demeanor on that windswept day contrasted markedly with the astonished attitude of motoring writers and the drivers he had beaten. Good-Time Bonnier had won a championship Grand Prix! He'd won it in a B.R.M. And he'd won it by refusing to be rattled under extreme pressure applied by Moss, Brabham, Behra and some other very savvy operators. At the Hotel Bouwes there was general agreement that this man had turned into a real race driver.

This belief was confirmed during 1960. At the Targa Florio — 10 laps around a 49-mile "circuit" — he turned in what he considers "my best race. When I turned over the car to Herrmann we had a lead of 2 minutes 55 seconds. He lost it; I don't know why. He was brought in a lap early and with three laps to go we were three minutes behind. I made it up and it was the best driving I've done. On the ninth lap I set the record, it was 42:26.0, and it was almost a minute better than von Trips. He was next fastest."

The 1960 Grand Prix season had opened in Buenos Aires on what had appeared to be a promising note. Locked in a spirited dice with Moss, Bonnier had held the lead as late as lap 68. Then a valve spring went and Bonnier staggered home seventh. As the Formula 1 season progressed Buenos Aires seemed to have been more grimly prophetic and less promising. At Monaco he was third in qualifying, led for the first 17 laps and then the rear suspension went. Zandvoort — blown engine; Rheims — valve spring; Spa — blown engine; Silverstone — rear suspension; Oporto — valve spring; Riverside — valve spring. The Formula 1 season was a big bust for Bonnier.

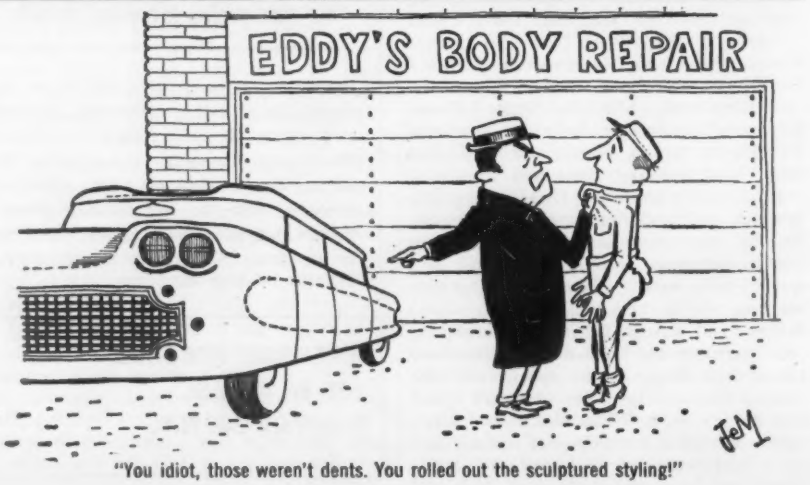
But as the 1961 G.P. season approaches, in which last year's little cars are this year's big ones, it's of more significance how Bonnier and Porsche did in Formula 2. They did very well indeed. A third to von Trips and Ferrari at Solitude was a bit galling since, as Jesse Alexander pointed out at the time, Solitude is in Porsche's back yard and it was almost as if Porsche had won at Modena. Bonnier won the F.2 race on the shortened Nürburgring which served as the German Grand Prix, then invaded Ferrari's back yard. To the great chagrin of Italians in general and Ferrari in particular, Bonnier won the Grand Prix of Modena after a terrific battle with von Trips which wore out his Ferrari's brakes.

When the European circus folded its tent, Bonnier joined the touring pros in the two sports car and two Formula races at Watkins Glen, Riverside and Laguna Seca. With much the same cast as in Europe, the Formula races were uneventful for Bonnier. The sports car races at Riverside and Laguna Seca were something else again. Bonnier joined Moss, Brabham and several others in being taken aback by the aggressive styles of a number of American drivers. The newspaper-promoted events drew enormous crowds and big purses. Bonnier is inclined to agree with a theory that some American drivers thought it a good idea to show these hot-shots from across the pond some real race driving. Joe was impressed, but not in the fashion intended. "A lot of them seem to think that to win a race is to push somebody off the road. They run straight into you. In Europe when you see somebody driving like that you feel sorry for them. But with those two races pretty soon I began to worry about myself."

Bonnier has had his share of shunts but he has managed to keep himself out of a hospital bed and he very seriously intends to maintain that record. His usually prudent approach to racing was inspired to a great degree by advice from Behra and Fangio. "It's a funny thing but Jean told me, 'Never go faster than you feel like going.' I guess Jean didn't take his own advice. Fangio helped me a great deal. I got to know him in '55 and I even went to his home town once. After practice he used to take me around the course in his own car, showing me what to do. He was the greatest driver in history; well, I don't know about before the war, I never saw any of those drivers, but certainly he was the greatest driver since then. He was superhuman. He was old and he had raced many times but the thing about Fangio was that he was so dedicated, he enjoyed it so much, that every time he sat in a car he was just like a little kid. He had a fantastic desire and determination to win no matter what position he was in. He was not easily put off. Some drivers are aggressive but they are easily put off. If things aren't going right they give up.

"Fangio told me, 'You must drive your own race. Do not drive to beat Moss or Behra or somebody else, even if the cars go zooming by you. Maybe they are going too fast. Maybe later you will go zooming by them.' That has helped me a lot." From this advice and his own experience Bonnier has developed a guiding principle that is stark in its simplicity but is ignored by many drivers: "There are two factors: the ability of the driver and the ability of the car. You cannot do better than that combination, and you should not try. If you must work very hard to keep up then obviously something is wrong." Luck? "It doesn't come to those who don't deserve it." Courage? "You don't want too bloody much or you'll get yourself in trouble."

Bonnier's great admiration for Fangio has had a strong affect on his view of the world championship. "Of course I would like to be world champion, but I don't think it's as important as it used to be. It was a big blow when Brabham won. I think the world champion should be a man who can drive any car fast under any conditions. Brabham is a very good Cooper



"You idiot, those weren't dents. You rolled out the sculptured styling!"

driver but outside of a Cooper he's helpless. Fangio was world champion in four different makes. There's no doubt that the greatest driver today is Stirling Moss.

"Before a race you go through the list and mentally cross off certain drivers; you say, 'I don't care about him.' My ambition is to be in the counting all the time. Then I think you've achieved quite a lot of what you're out for."

Joe is also out for much more than a rip-roaring time these days. He and Marianne have moved to Lausanne and have bought property with a magnificent view of water and mountains. The move was not to escape Swedish taxes – Joe believes "Within a few years taxes will be the same all over Europe" – but because Switzerland's central location will let him have much more of a home life. Joe used to have trouble imagining himself as a father, but after spending a great deal of time last year with the Graham Hills, and seeing how much they enjoy their two children, he's beginning to think along parental lines. And to accent the swing to domesticity, Joe has even toyed with the idea of shucking his beard: "Now I'd sort of like to shave it off, but I don't think anybody would recognize me. It's sort of a trademark; *Barbetta*, the Bearded Swede and all that."

If the Bonnier pace has slowed, life is still far from dull. Joe has long been a discriminating collector of modern art – "If I may say it myself I have a very good collection." Now he and a Swedish friend have opened a gallery in Lausanne. It's not a wild fling; businessman Bonnier doesn't participate in that sort of operation. The friend's father has Sweden's biggest modern art galleries and all the necessary contacts in Paris, "which is what counts." Joe plans to "go motor racing as long as it's fun, no longer. After I have to work to keep up with the other drivers then I quit. If the gallery is a financial success then maybe that's what I'll do afterwards."

The time when racing will no longer be fun is in the vague future. "The last two years I've been increasingly serious about it and by now it's my life. It sort of grew on me and I realized I could make a pretty good living out of it." It's an indication of Joe's stability that he has found the last two years rewarding ones. Many drivers would have been torn by anguished frustration, existing in a twilight zone between the established stars like Moss and Hill, and the boy wonders like McLaren and Surtees. Bonnier says it hasn't bothered him in the least. "Motor racing is a thing like any other job. You have to have experience to do well. They [the young flashes] have ability and desire. They do well once or twice or three times, but consistency – that's what makes a really good driver – takes four or five or six years. You have to settle down to a certain style, to learn what to do when you hit rain or when you hit oil at speed. You have to learn how to nurse a car, learn your own ability. You have to learn yourself."

Joe feels he has now acquired this essential experience. With the dependable and potent Porsche products to work with this year, he should most definitely achieve his stated ambition "to be in the counting all the time." —*SMcN*

ROAD TEST OLDSMOBILE

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overseas too, an example of One World in the automotive business.

No matter how you feel about automatic transmissions, every interested enthusiast should drive one once in a while in order to realize what extraordinary devices they have become. (Come to think of it, a 1939 Oldsmobile with an original Hydra-Matic would make an interesting collector's item about now, wouldn't it?)

The drawback still is that no matter how smoothly they shift nor how sensibly arranged they are in respect to *when* they shift (a mixture of car speed and throttle opening determines this), there is always the transient problem. If you're going 25 mph and the magic box is in 2, when you ease off, intending to get right back to the same small throttle opening in a jiffy, the mechanism jumps to the short-sighted conclusion that it's time to shift to 3. It does so, and when you do get back on the gas you're in a different gear and must use a larger throttle opening to maintain the same rate you'd had in mind. When it's all written out like that, it sounds picayune perhaps, but to a guy who likes to tell the machine what to do it's frustrating. To ease his plight, the F-85 is available with three-speed, column-shift transmission for $189 less.

What is this new Hydra-Matic like? We won't even begin to describe the mechanism except to point out it took the British magazine AUTOMOBILE ENGINEER some 14 full pages to describe and illustrate it while the Oldsmobile Service Manual devotes 82 pages to it (compared to 14 for the synchromesh transmission and clutch). We will, however, tell you what it's like to use. Why? Most of you readers are probably quite familiar with Hydra-Matic but because they work so smoothly and so subtly, we think it's of interest to describe in complete detail exactly what they will do and won't do.

To begin with, the column-mounted shift level has a P-N-D-S-L-R quadrant, the same as all recent Hydra-Matics. Park, Neutral and Reverse are obvious enough, but the others have a surprise or two.

In each case, let's assume that we're starting forward from rest and keep in mind that the accelerator pedal may or may not be pressed to the floor. While Low, Super and Drive refer to the quadrant positions, let's use 1, 2 and 3 to refer to the three speeds available (for the two concepts are not identical).

The car always starts in 1, whether in D, S or L. If you're in L, it just won't ever shift at all. If you're in either D or S, it shifts to 2 somewhere between 12 and 30 mph (the more throttle, the later the shift). If you're in Drive the shift to third occurs between 17 and 60, again depending on throttle opening. But if you're in Super, you may be in for a surprise. You'll still get a shift to third and at 60 mph. The difference is that it shifts then and only then, no matter what the throttle opening. What that position on the shift quadrant does in effect is permanently hold down the throttle detent so that the gearbox "thinks" you're floor-boarded. So much for upshifts.

Downshifts do not take place at quite so high a speed as upshifts for a given throttle opening. This prevents unpleasantly frequent shifts. Unless you're climbing an extraordinary steep hill, downshifts occur more or less at the driver's command.

At any speed below 55 mph, you can downshift from 3 to 2 by floorboarding the accelerator. In fact, if you're going more than 38, that's the only way to downshift. In this respect it's rather like driving a car which has Borg-Warner overdrive with its automatic kickdown. The difference is that below 38, the kickdown (which continues to be felt at the accelerator) can be obtained with only partial throttle. The lower your speed, the further from the floor do you get the downshift, until finally at about 20 mph you get it with the throttle closed. A drawback which will only become evident after several years is spelled out carefully in the manual; you cannot start the F-85 by pushing it.

Of course all the speeds mentioned are those from our test car and are in fact subject to adjustment. In truth, this is where the Hydra-Matic is either a mechanic's delight or his despair, depending on his skill and, perhaps, his luck. The Service Manual gives the acceptable range within which all these shifts should take place, but of course making the Hydra-Matic perform according to Lansing is easier said than done. The linkage between the accelerator pedal and the transmission is complex, yet its adjustment is the controlling factor. If you lengthen it the transmission will always "think" the throttle is more open than it really is, and tend to make its shifts at lower speeds. For dragging out "through the gears", the linkage can be slightly shortened, but if you overdo this, the closed-throttle shift points are raised too high which is annoying when you're driving gently.

In case you wonder why we devote so much attention to this one problem of adjusting the Hydra-Matic, it's because that's the only problem the test car had during its more-than-8000-mile test run (New York-Florida-California-New York). No less an expert than Stirling Moss has stated that, for driving cross-country in America, he'll take an American car every time. Of course, we couldn't get him to sign up on our test crew but we did get two of his countrymen, Peter Garnier of THE AUTOCAR and Michael Tee of MOTORSPORT and MOTORING NEWS. They drove it from New York to Daytona Beach and then to Los Angeles. Having flown out for the Riverside G.P., we drove it back. The only mechanical difficulty encountered was that after returning to New York, it was necessary to adjust the throttle valve linkage because it was refusing 2-3 upshifts at full throttle.

That's what we call reliability! Our visitors reported, "not a single rattle, squeak, or groan . . . invaded the interior of the car. The tires were unmarked, and in the length of time we had the car [4336 miles and eleven days] the pressures were untouched. Although we drove through violent rain storms and thick dust clouds, nothing came inside the car nor crept into the ample trunk, and if this is an example of the cars of the future, then European manufacturers will have to look to their laurels or lose a valuable export market."

An interesting comment on the difference in driving habits of certain journalists was revealed from the careful gasoline consumption records kept by all concerned. While our editors got from 16 to 20 miles per gallon, the visitors achieved only 13 to 17½. They didn't keep time and distance logs, so we don't know what sort of averages they were putting up. But we did hear that they'd collected nearly half a dozen speeding tickets in the 4300 miles. Try that on your local point system!

In the publicity race for the much-vaunted 50-50 weight distribution, the lightness of the engine more than makes up for the forward location of the transmission (which also is largely aluminum). The F-85 gets 48 percent of its curb weight onto the driving wheels, a percentage point better than the Tempest. The difference is quite small though; what is more important is that the conventional, old-fashioned rigid axle at the rear ensures that the rear wheels are always parallel to each other and very nearly perpendicular to the road. Since it's well located by four trailing arms (the upper two sweep in to the differential housing), the side-bite available at the rear remains consistent during hard cornering, even on irregular surfaces.

When you first drive the F-85, it feels

"No, that wasn't the dip stick."

like an American car that's been on Metrecal. Its ride is soft and comfortable, the controls work easily and smoothly, the heater and defroster do justice to an Arctic expedition, the brakes are smoothly adequate and there is a carefully contrived air of elegance throughout. Built to the usual Detroit proportions of long, low and wide, it is only a bit narrower than the standard-sized cars and like them does not seek out tiny gaps in traffic to any avail.

But in keeping with this, the steering is depressingly slow, taking up 4.2 turns lock to lock with the in-our-opinion-unnecessary power boost and over six without. Despite the very low forces involved, the wheel is a generous 17 inches in diameter.

Also holding the F-85 to its image of a thinned-down 88 is the very soft ride. A disappointment here is that to get big car comfort over bumps despite the lighter weight, the spring rates are much reduced. As a consequence, the F-85 bottoms out at the front more easily than a hard driver will appreciate. On a long, hard turn the outside front wheel can get pushed right up against the rubber stop and then any bump will make the car rock gently about a diagonal axis from there to the inside rear. We uncovered this on the C/D Test Circle where the F-85 revealed itself to understeer more than any car covered in our Road Research Reports, but less than a 3.8 Jaguar.

We drove an unpowered-steering F-85 as well as the powered version. The reduced quickness (to minimize forces at the steering wheel) makes it less desirable from a sporting point of view. With ¾ of a ton on the front wheels, the power comes in handy when parking all right, but what impressed us about the Saginaw unit fitted was that you really didn't know you had it when you were driving down the road. It does not reduce steering forces to the vanishing point, unlike some such devices where the designers seem anxious to ensure that everyone is aware that they really got their money's worth of power steering.

Our strongest impressions were of the car's reliability and quiet pleasantness on cross-country journeys. We have mentioned elsewhere our hopes and expectations for the marvelous powerplant it shares more or less with the Buick Special (See SCI, Nov. 1960).

We have no illusions that everyone in America ought to be driving sports cars or sports sedans. To a lot of people, a car is merely a means of getting from here to there, the less nonsense the better. While some of our reservations about the conventional American car have been based on their unsporting behavior, their foundation stems from the conventional car's inability to do the tasks it's claimed to excel at.

Seven-league boots are a great convenience, up to the point where everybody wears them and we're all stepping on one another's toes. Then they become a nuisance, and we're all better off barefoot. The Olds F-85, which easily does so much that its bigger brothers do, highlights a welcome reversal of the erstwhile trend toward grossness.

It and the cars like it put convenience and comfort back in the American motoring scene. We hope they sell millions of them. —*C/D*

THE AFRICAN PIG

Continued from page 72

had managed to make it look like a sports Pignatelli – even though it had unusual bumps in various places. Of course the umbrella must have cut down the top speed, but you've got to admit the sun wouldn't bother you.

One look at it convinced me that the old man had beaten out Rolls on this sale. I figured those knobby tires for desert driving, between one oil well and the next. It could be for Texas, but then the still was for palm wine, not bourbon. Turns out it was for central Africa.

The papers were all made out, and I saw I was in for some ride. The name of the consignee was easy enough: His Excellency the Right Honorable Cyril Joseph Neville Casabubu. Care of Government House, Zomba, Republic of Tsumbyasa. I got out the Guide Michelin on Africa, but I couldn't even find the country in the index. Nobody else seemed to know where Tsumbyasa was either, and, as this was a C.O.D. delivery, old man Pignatelli started to sweat peanut butter. Obviously, he had paid the coachbuilder on delivery, so even if he could rescue the chassis he was out something like twelve million lire. While the chief was rolling around on the floor and stuffing pieces of carpet in his mouth, I made a couple of phone calls.

Finally the United Nations set me right. Tsumbyasa was a pretty new country, all right – less than three days before it had been called Zombubu Colony, and was ruled by England. But the colonial office had had their accountants in, and had discovered that the net profit on exports of palm oil and juju charms was considerably less than the salaries of the Colonial Governor, Chief of Police, and the bush-pilot who was Minister of Transportation.

So, after proper consideration of about an hour and a half, they dropped Zombubu Colony. What happened was they appended the usual resolution on the burning desire for self determination on the part of the Kasvilububu tribesmen to a bill for new plumbing in the House of Commons. It was passed, natch. They sent a carbon to the United Nations and one to the American Foreign Aid section.

The British Governor gave a carbon of the bill to Mr. Casabubu as he boarded his plane, which was piloted by the Minister of Transportation and contained the Chief of Police, plus five filing cabinets, and six and a half bottles of Scotch whiskey. First thing Casabubu did was apply for foreign aid to the U.S. Second thing was to call up Automobili Pignatelli and order his Pig as the official State Vehicle.

Well, you know all about the troubles in Tsumbyasa. Just as Casabubu won the plebecite, Khrushchev found out the place was independent, and raised hell that nobody had told him about it. This got everybody sore, especially when the Ambassador of the Chinese People's Republic got picked up for selling palm wine labeled White Horse Scotch to the diplomatic corps. It was just after this incident that the revolution began, and I arrived in Tsumbyasa with the Pig – a little dusty and running hot, but ready for delivery.

I got into Zomba about dinner time, and asked a cop for directions to the hotel. After no more than an hour or so of driving around the kraals, I found it by myself, right in back of where the cop was standing. I must confess I was a little confused by the barbed wire and sandbags all around the veranda, but if you've ever been on a Mille Miglia, a few machine gun emplacements come under the heading of crowd control. For that matter, I understand they're putting them in the paddock at Lime Rock next year, to protect the Tech Inspectors. I put the Pig in the hotel garage, drained what little water was left, and stuck the distributor cap in my pocket for safe-keeping.

Next thing was a shower and a long gin and tonic. After dinner I got the Italian Consul on the phone and asked him to put me in touch with Premier Casabubu.

The Consul, Commendatore Mangecavallo, was a gasser. The minute he heard Pignatelli, he dropped the phone and ran all the way to the hotel. Nothing would do but that we go down to the garage and have a look at the Pig. "*Che bellisima. Che nobile.*" Nothing would do but I show him 7500 in fifth through the main street. Then we got to talking about delivering the car. This took a couple of hours, because the ice packs didn't stop his tremors right away.

He finally got me an appointment with Premier Casabubu at ten the next morning. I locked up the car again, and tottered off to bed.

Not five minutes later a land-mine went off under my window. This hinted that there might be a spot of bother, as Stirling says when he loses a wheel. The insurrection went on all night, but by morning things were calm again. I had a lovely breakfast on the veranda, eating mangoes while I watched the cops carry off the bodies of last night's loyal opposition. By ten, the Pig was parked in front of the machine gun nests in front of Government House, and I was in front of Premier Casabubu, a very nice-looking man, if you like filed teeth and tribal tattoos.

I gave him a rundown on the technical specs, handed over the documents, and waited for the money to be produced. Twenty-three million lire is a lot of East African pounds, or even American dollars. I had an idea that at the current exchange rate, it would be an enormous amount of cowrie shells. But I hadn't realized I was dealing with the Head of State – and one who had majored in double-entry bookkeeping at the London School of Chiropody. All I got was a dazzling smile (the back molars are filed, too) and an imposing piece of paper which was a draft on the State Bank of Tsumbyasa. "Could cash it right down the street, please."

I hot-footed it down to the bank, figuring I could get the loot and make it to the airport in time for the noon plane to Nairobi. And no sooner had I one foot on the first marble step, when there was a hell of a bang, and somebody slipped me a Mickey.

I woke up underneath the rubble, with the Italian Consul pulling on one leg and a big Danish U.N. soldier on the other. After they had decided that the Dane was stronger, they wiped the blood off me and stuck me in the back of a jeep. Commendatore Mangecavallo got me into the U.N. refugee plane that night, and believe me, I was glad to go.

After all, it wasn't like I could do any more to collect Old Man Pignatelli's money. There wasn't any bank left to go to. So I delivered the bank draft to the old man the minute I got back to the factory, and then went out to get loaded. I had only got on the third drink when the entire racing team, including mechanics and design staff, dragged me back to Il Signore's office.

He was hollering so loud that I couldn't make any sense out of it all. Finally, he stuck a newspaper under my nose, which made me feel very weak indeed. Seems Ex-Premier Casabubu had fled the country. There was a new People's Pan African Revolutionary government, and there was a price on the head of the imperialist gangster, Casabubu. Further, the new People's National Share-The-Wealth Bank and Pool Parlor had been established, with currency based on the gold reserves held in trust for the People's Republic of Tsumbyasa by the U.S.S.R. All debts, bank drafts, loans, markers and pari-mutuel tickets issued on the old currency were, of course, worthless.

I finally got Signor Pignatelli off the floor, and got his right hand out of his mouth. It was well-chewed, but still intact. "Well, we can throw the bank draft out with the dirty rags. Now we gotta get the car back so we can sell it to E. A. Silverspoon, the wealthy American sportsman. He's ripe for a new Pig. He burned up his last communting to Wall Street via Second Avenue."

The old man nodded his agreement, and put in a call to Luigi Casseti, our American representative. Luigi spends his waking hours selling Pigs to E. A. Silverspoon. Before I could get the story out of my mouth, Luigi let me have it. In his own way, he's just as excitable as Signor Pignatelli, except his Italian is more broken than his English.

He wanted to know why he hadn't collected commission on the special-bodied Pig he saw in front of the United Nations building. The one with the still behind the seats and a parasol where the roll-bar ought to be. What were we trying to do, cheat him?

Well, it don't take a house to fall on me. Casabubu had made it to New York, and somehow had found time to take the Pig with him. Obviously, he was at the U.N. to plead for his reinstatement as Premier and the overthrow of the People's Pan African Revolutionary government. I figured all we had to do was wait until he got back to Africa, present the draft, and go home counting the loot.

But Signor Pignatelli told me in no uncertain terms to stick to shifting gears—he would take care of the finances of Automobili Pignatelli. He figured before Casabubu got his power back, Khrushchev would be elected president of the D.A.R. By then the Pig would be ready for an antique car museum, and Pignatelli would be owned by a typewriter company.

I got on the plane to New York that afternoon. Il Signor told me kindly to come back with the car or the money, or not to come back at all.

Casabubu was delighted to receive me at his suite in the Waldorf. He was very busy buttonholing various U.N. delegates prior to his speech next Thursday. But he did have some questions about the car. Like, were the rear brake discs supposed to glow bright red all the time, and where was the handbrake lever located? Like, the acceleration was disappointing; was it permissible to start the car in first gear rather than fifth? Like, what was that little trapdoor on the bonnet marked 'olio'? I figured if I didn't get that Pig soon, all I'd have left would be the solid gold hubs and maybe the umbrella.

But when I brought up the question of payment, the ex-premier was less than happy. Hadn't he given me a bank draft? Certainly he had paid. Besides, the car was the property of the Tsumbyasa Republic in Exile. Did I dare say that the Tsumbyasa Republic in Exile didn't pay its debts? Or that its money was worthless? He was half a mind to complain to the U.N. about *me*! Personally. When I tried to explain that Signor Pignatelli was already complaining about me, he got even more discouraging. He asked his bodyguards to show me how sharp their scimitars were, and described the kind of poison they smeared on the tips of their spears. I was convinced. I was also outnumbered. So I left. Now whenever I get home to New York, first thing I go to see Mama. She makes up a big pot of Pasta Fazool, and tells me all about how things are no good at the gas station, and the neighborhood is going to hell, and other things of general nature. On the second day, I always go out to Glen Cove to have dinner with my Uncle Dino Parenti. He treats me just like a son, especially now that Dino Junior is away at Harvard, and Big Dino is all alone in his great big house with the electrified wire fence all around it.

There are unkind people like Mr. J. Edgar Hoover who claim that Big Dino is not a strictly-legit business man, but in this country you gotta *prove* things like

(Continued on page 122)

(Continued from page 121)

that. And since my uncle hasn't packed a heater since 1926, I for one consider him very respectable indeed. And also very rich. It's true that every so often he suggests that I carry a couple of packages of white powder in my suitcase next time I come home, but when I turn him down he never gets sore at all. We have a very loving relationship, my Uncle Dino and I.

So you'll understand that when we got done with our steaks, I told him all my troubles. By the time he lighted his big Havana and poured himself a snifter of brandy, he had the whole plan for me—perfect in every detail.

"Kid", he says, "one thing you gotta forget is trying to get money from this Casabubu. As my old friend Charlie Lucky used to say when he was in the collection business, you can't get blood out'n a onion. So you gotta get the car."

How? "Easy. He comes out of the side entrance of the Waldorf every morning. OK. One morning a set of my boys are waiting in one of my Caddies. He gets in the Pig and sticks the key in the ignition. Willy Cohen lifts him out of the Pig and lays him down on the street. Not too hard, but firm. The others take care of the bodyguards with the funny clothes. When it's all done you hop in and drive the Pig over to Jersey, with my boys following just in case there's a beef. We stash it in one of my artichoke warehouses until the right boat comes along. In a month you're back in Milano with the car. And old man Pignatelli will thank you. If he don't, just tell him I said to."

It was so simple it was perfect. I had no doubts at all about Uncle Dino's friends delivering as planned. I suspected they had pulled much more elaborate snatches than this one, and made them stick. And the beauty of it was that Casabubu wouldn't be hurt, but he'd never know who took the Pig. Even if he finally suspected, he wouldn't have a leg to stand on once it was back in Milano.

So there I was, not two days later, sitting in the back of a big black Cadillac with very thick window glass, waiting for Casabubu to appear. The Pig was waiting for him, parked right in front of the Waldorf 49th Street entrance, with a doorman resting his big fat foot on the aluminum skin of the nearside fender.

The ex-premier appears, closely followed by his be-robed bodyguards. He gets into the cockpit, and they arrange themselves on the rear deck. The Caddie pulls up alongside and everybody gets out but me. There is absolutely no commotion, but a close observer would notice that the bodyguards are now leaning heavily on four large men, all wearing double-breasted pinstriped suits and wide-brimmed pearl gray fedoras. Their eyes are turned up into their heads, as if they had been belting just a little too much sauce too early in the day.

Willy Cohen, who is only about five and a half feet tall, but must weigh 250 pounds, not counting armaments, reaches in and grabs Casabubu by the neck of his brocaded robe. The back of the robe comes off in his hand (you must remember that Willy's previous experience in putting the collar on people is confined to regular suits and maybe a cashmere overcoat or two). The ex-premier lets out a howl—and at the same time lets in the clutch. It's just my luck that this is the time he finally finds first gear. The Pig is half-way down the block toward Park Avenue before the Cadillac can even start.

I notice flashing red lights and police sirens coming up Park Avenue. It's a motorcade from the U.N. heading up the avenue to one of the embassy buildings. And from the look of things it's carrying somebody pretty important. As he reaches the intersection, Casabubu wrenches at the wheel. I realize he's having trouble with the brakes. Pow! The Pig slams right into the middle of the biggest limousine in the motorcade.

And then all hell breaks loose. Khrushchev (who were you expecting, maybe Peter Lawford?) sticks his head out of the limousine and starts yelling "Imperialist assassins." The chauffeur jumps out with a tommy gun in his hands and pours bullets into the Pig. Stocky, slavic-looking men in suits with flappy pants appear out of nowhere and bullets go singing up and down the street. Pedestrians run for cover. A cop or two gets nicked, and the rest of them return the fire. In three seconds it's like the Battle of the OK Corral, but there ain't no horses to lam out of there on.

Suddenly I realize I'm all alone in the Caddie. Uncle Dino's friends don't mind a little gunplay, but they want no part of atomic warfare. I figure the best I can get out of this is a flesh wound, so I hop into the Waldorf and hide in the men's room. And I wasn't alone. Seems like everybody in New York except the Russians were in there with me.

After they had cordoned off the block with a regiment of Paratroops, I just kind of strolled away from there. The Pig was still burning fiercely.

That's what can happen when you deliver a car. And that's why being a factory driver isn't all champagne and caviar. I got back to Milano with my sad story to find that the whole team was off to Monaco for the first Formula 1 race of the season. By the time I got down there it was race day. And by the time I explained what happened to Signor Pignatelli, the cars were on the grid.

The one-minute klaxon blew, and I raced out of the pits, stuffing my head into the crashhat. I jumped for the car just as the starter raised his flag. It was our brand-new model, the new rear-engine job, and me without one lap of practice. And after I jumped, I landed. That's gravity. But not in the cockpit. On top of the windscreen. By the time I realized that the cockpit was twelve inches wide and my rear was fifteen, they were off around the first bend.

It seems that while I was touring around Africa, they had developed the new model. And while I was in New York they had tailored the cockpits for the drivers. But they had guessed at my breadth of beam, because I wasn't around to be measured. Maybe I put on weight, eating Mama's Pasta Fazool. One thing for sure: I couldn't get into that Pig with a shoehorn.

Now how are you gonna explain that when the motoring journalists come around asking for the lowdown on why Pignatelli lost the *Grand Prix de Monaco*? —*RGL*

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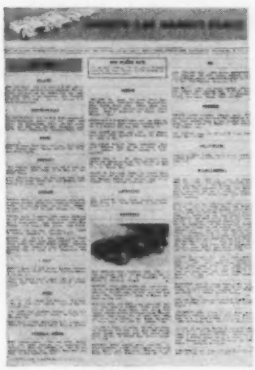

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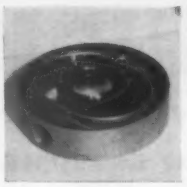

TECHNIQUE OF TOMORROW'S POWER

Continued from page 101

being those of Curtiss-Wright's M. Bentele, on the subject of the Wankel engine's general design parameters:

"Progress in the technical evaluation and application of the rotating combustion engine has been made in a displacement range of 1 to 250, namely from some 7½ to 1900 cubic inches, warranting a survey of this new prime mover's design parameters.

"When increasing the speed of a given size engine, the first problem encountered is combustion. It is affected by the manifold and porting arrangement, the combustion chamber shape, the transfer velocities inside the chamber during the transition through top dead center, and the spark plug location. We have developed an adequate combustion characteristic for current engine outputs and additional work is underway to improve it for higher speeds, i.e., higher power. However, since part of the combustion chamber shape is solely determined by the geometry of the trochoid and the rotor envelope, the combustion phenomenon will present a challenge at the high-speed and high-power end.

"Power and economy at higher speeds will also be limited by friction – that of the rotor and its bearing, that of scavenge oil churning within the power section, that caused by the motion of cooling oil inside the rotor, and that within the gas passages. Knowledge of all these factors, both qualitatively and quantitatively, leads to design features which will reduce their harmful effects.

"At the low-speed end, engine performance is – apart from porting, timing and overlap – mainly influenced by the effectiveness of the gas seals. Seal operation is significantly improved by an increase in speed, and though improved seal designs helped the low end considerably, it appears this limit is more severe than with the reciprocating engine."

EXPERIENCE BREEDS ENTHUSIASM

Dr. Walter G. Froede presented the SAE with extensive test results, many of which you've already read in SCI and CAR AND DRIVER, then summed up his current thoughts on Tomorrow's Power:

"In examining our test results, you must consider that our base of experience is still far too narrow to permit any optimum solution. Though the engine is made up of only a few major components, it allows a multitude of variations and combinations which require a very careful and thorough research program.

"The few experimental engine types that have been built and tested do prove that for certain estimated configurations, results have been obtained which are not too far from performance and endurance data associated with highly-developed modern reciprocating engines. These estimates, for instance, refer to: chamber size, trochoidal contour, chamber width, port size, intake and exhaust timing, shape and location of combustion chamber, location of spark plug, compression ratio, dimensions and fit of sealing elements, type of fuel and lubricant, and so on.

"On the other hand, it's evident that this rotating combustion engine is vibration-free, requires a fraction of the usual overall volume, permits extremely low weight per horsepower, and contains a minimum of components. None of the parts requires exotic material or high machining precision, leaving no doubt that production cost can be cut to a fraction of that of a reciprocating four-stroke engine of the same output.

"We can't foresee which size or application of the Wankel engine will be produced first. It's not certain whether the high-rpm possibilities will be utilized, or whether the speed range will be reduced in accord with the requirements of the accessories. Diesel editions are still in the design stage, and the first experience with air cooling is just now being gathered. The only fact that must be emphasized is that during the past years of development nothing occurred that indicated a barrier that couldn't be conquered. It appears that only research effort will determine the time when this type of engine will be ready for production."

When will that be? The most informed observers expect that the engine will be in production in Europe by the end of 1962, perhaps earlier. In the meantime the relationship between NSU and Curtiss-Wright is not getting any more friendly, rather the contrary. Now under new direction, C-W feels that any other American firms that want to use the engine, General Motors included, should buy them direct from C-W with no chance to obtain a license to build them themselves. The contract doesn't cover this, according to NSU, which has recently filed suit against Curtiss-Wright for "clarification of contract" in the Federal Court of New York.

Other signs indicate this is not just an amicable settlement. As Dieter Korp has written, "One can't imagine that this international tug of war with the engine would be taking place if the contestants didn't really believe they had the key to big, big business." Makes sense! —*KEL*

IN NEXT MONTH'S C/D:

- **Project Time Machine: The Engine by Griff Borgeson**
- **RRR: Maserati 3500 GT**

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The Marquis de Portago with world champion Juan Manuel Fangio at the French Grand Prix.

Alfred Neubauer, Stirling Moss (right) and Denis Jenkinson after their 1955 Mille Miglia victory.

The Cooper team, left to right: Jack Brabham, Bruce McLaren, John Cooper.

You wait with the chief-driver in the pit "sweating out" every hour of the race!

Moss (11) and Brabham (8) taking a corner at the Dutch G. P. Zandvoort

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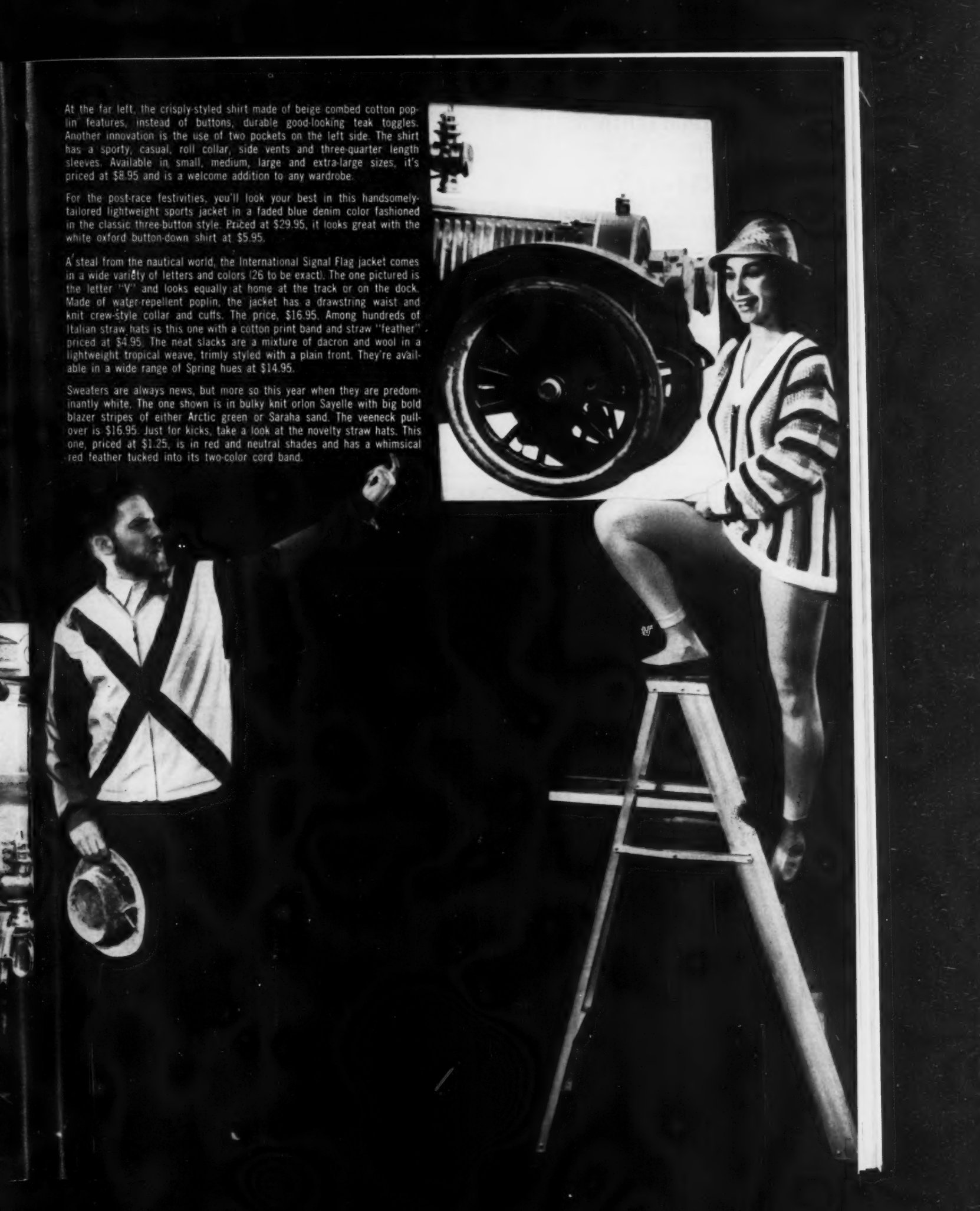
If you're a sportsman with a sports car, you're probably as conscious of your attire as you are of the attention you pay to doing a thorough job in the weekly "Saturday morning concours." B. Altman and Company, on Fifth Avenue at 34th Street (just about far enough from our C/D office to allow a full first-gear drag and a quick burst in second) is offering SPORTS CAR SPORTSWEAR this spring as up to date as desmodromic valves. We selected a few of the latest items, choosing to represent them against an ancient and magnificent Delaunay Belleville (circa 1905) from the Kalison Archives. You may wonder what a girl is doing in a men's fashion spread. The answer is simple. We rarely have occasion to picture an attractive distaff enthusiast and couldn't resist the opportunity as Harvey Shaman set up his camera.

At the far left, the crisply-styled shirt made of beige combed cotton poplin features, instead of buttons, durable good-looking teak toggles. Another innovation is the use of two pockets on the left side. The shirt has a sporty, casual, roll collar, side vents and three-quarter length sleeves. Available in small, medium, large and extra-large sizes, it's priced at $8.95 and is a welcome addition to any wardrobe.

For the post-race festivities, you'll look your best in this handsomely-tailored lightweight sports jacket in a faded blue denim color fashioned in the classic three-button style. Priced at $29.95, it looks great with the white oxford button-down shirt at $5.95.

A steal from the nautical world, the International Signal Flag jacket comes in a wide variety of letters and colors (26 to be exact). The one pictured is the letter "V" and looks equally at home at the track or on the dock. Made of water-repellent poplin, the jacket has a drawstring waist and knit crew-style collar and cuffs. The price, $16.95. Among hundreds of Italian straw hats is this one with a cotton print band and straw "feather" priced at $4.95. The neat slacks are a mixture of dacron and wool in a lightweight tropical weave, trimly styled with a plain front. They're available in a wide range of Spring hues at $14.95.

Sweaters are always news, but more so this year when they are predominantly white. The one shown is in bulky knit orlon Sayelle with big bold blazer stripes of either Arctic green or Saraha sand. The veeneck pullover is $16.95. Just for kicks, take a look at the novelty straw hats. This one, priced at $1.25, is in red and neutral shades and has a whimsical red feather tucked into its two-color cord band.



ROAD RESEARCH REPORT: PEUGEOT 404

Continued from page 56

how. The temperature control isn't thermostatic (unlike Volvo's, for instance), so the heat output often varies according to the way you use the car. Maximum output is ample, and defrosting is effective. The centrally-placed heater housing has two adjustable outlet flaps, and carries the switch for the single-speed blower.

A real contribution to silence is made by the Citroën-type ventilators at both ends of the dash. This is a wonderful invention, supplying large volumes of fresh, cool air — or micrometrically small volumes, if you prefer — with near silence, no worries about rain, and quick and easy positive control. All that's needed now is a similar exit from the rear of the interior. We found that circulation was enhanced by driving with one rear window cracked open.

All the instruments are housed behind a one-piece plastic panel with a shallow integral shroud. The wide speedometer is a disappointing device, with calibrations that are hard to read and a mechanism that would lag occasionally. Other instrumentation is comprehensive, and the lighting is rheostat-variable and effective. An easily-reset trip odometer is a welcome standard fitting.

On the right is a wide lid over a huge downward-sloping glove compartment that looked big enough to pass the Speed Graphic test. A Rolleiflex would easily go in with a Leica for company. As on the 403, though, no lock is provided.

DEEP-KNEED SUSPENSION

As we've said, this is a thoughtfully-equipped interior that adjusts to you completely, leaving you free to drive the 404 to its maximum with a minimum of fatigue. You're aided in this by the sedan's remarkable ride. Obviously one major goal of the 404's designers was a suspension with longer travel than that of the 403, which has a firm ride by 1961 standards. One step in this direction is the use of tubular shock absorbers all around, designed and built by Peugeot. These were tried out experimentally on the 403, and as a direct result, tubular shocks now replace the original lever units on the back of the older car.

403s were also used to test the new pillar-type front suspension, which allowed Peugeot to get deep suspension movement at the front without introducing the geometric discrepancies that wishbones alone can sometimes cause. No anti-roll bar is fitted, either at front or rear.

Getting longer travel at the rear was more difficult, as it always is in a sedan with a large luggage volume right over the rear driving wheels. Achieving it on the 404 meant that the tail end of the car had to be raked up at a jaunty angle with the vehicle empty, in order to avoid annoying bottoming when it's fully loaded. The springs at all four corners are now deep coils.

Peugeots are unique today in having

torque tube drive, a once-popular system that remains a very positive way to locate a live axle. It tends to be heavy, requiring an extra housing the whole length of the drive shaft, but they make up for this at Sochaux by encasing the entire rear axle in aluminum, a rare technique even today but one with which they have ample experience. It's light enough so they've had little reason to think seriously about independent rear suspension, at least for the 404.

Results, in terms of ride, are impressive. The 404 is very steady at all times yet retains a flexibility that provides remarkable comfort over the roughest surfaces. In view of the fact that Michelin X tires were fitted — casings which tend to magnify road rumble — the ride over fine corrugations was outstandingly smooth.

STEERING REMAINS PRECISE

Though the 404 does roll markedly in corners — more, certainly, than the 403 — it does so without vice and without tangible effect on the steering. Wheel feel remains precise and consistent, a very difficult thing to achieve with rack and pinion steering in combination with long suspension travel. In fact the 404's steering sets an example for sedans of this size, with its easy lightness combined with a tight turning circle and a speed of response quick enough to cope with everything except all-out racing. It's much lighter than the 403, which we feel makes the newer car less fatiguing to drive, in combination with the revised driving position.

Steering effort does increase toward full lock, especially when parking, but this may partly be an effect of the Michelin X tires. Conversely, of course, "X" gets much of the credit for the steering's rapid response. The driver's feel of the road through the wheel is unusually good for a sedan, giving a clear indication of front-wheel bite that's particularly useful on snow. We noticed one fault, on more than one 404 and in varying degrees: a slight tremor of the steering wheel at speeds of 60 mph and above. It seemed to be peculiar to one car, at first, but showed up often enough to be worth mentioning.

Apart from the new front suspension, the 404 chassis differs markedly from the 403 only in its reduced rear tread, which is now 2.6 inches narrower than the front tread. Perhaps as a result the 404 has more engineered-in understeer, in spite of the lack of a front anti-roll bar. Interestingly, though, the amount of understeer that shows on the Steering Behavior graph isn't a fair indication of the way the 404 feels on the road. It has a light, well-balanced manner, indicating good weight distribution and a relatively low polar moment of inertia. It's wonderful to drive fast over tightly winding roads, since it can be tossed from right to left and back again with minimum delay. At the extreme limit the tail is very hard to break loose, unlike the 403, and the front wheels are actually apt to lose their grip first, especially on wet roads.

SMOOTH NEW ENGINE

There's enough power to keep moving fast, too. There are no excess horses, to be sure, but there's a very fat power curve without flat spots from an engine that runs so smoothly and quietly you have no com-

(Continued on page 130)

(Continued from page 129)

punctions about using it to the full at every opportunity. It's clearly Peugeot policy to provide refined, unobtrusive power like this, the kind you can use without noise or embarrassment. Smoothness was probably a major motive for the deeper cylinder block casting of the all-new Type XC engine in the 404 (403 engine is Type TN3, the 203, Type TM).

The design of the XC engine is obviously derived from the TN3, but there are practically no common parts and "all-new" really applies. Many similarities naturally depend on a desire to use the same kind of machines to produce both engines. One such is the relationship of cylinder centers, the total end-to-end distance of both engines being an identical 310 mm. To make room for the bigger bore of the XC, the two inner cylinders were merely moved 3 mm each toward the center of the engine, or 6 mm closer together.

Like Renault and Citroën in France, Peugeot uses removable wet cylinder liners in a cast iron block. Peugeot has developed its own simple but fast foundry equipment for casting these liners centrifugally in shell molds, to a high degree of precision. The iron used in the liners contains 0.5 percent chromium, to retard wear, and the feeling at Peugeot is that they would not yet want to tackle the job of making a complete, more complex integral cylinder block entirely of this chromium-alloy iron. At present the block is a relatively simple casting of plain gray iron. It might as well be of aluminum, since the wet liners are already there; Peugeot is working on this but wouldn't consider changing until a new car is designed to take advantage of an aluminum engine's lighter weight.

DESIGN DECISIONS

Peugeot is an impressively self-contained company, even to the extent of making its own pistons in semi-automatic permanent mold equipment. They recently adopted a copper-nickel aluminum alloy, used under license from Karl Schmidt of Germany, in a design simplified over that of the 403. Three rings are used; Peugeot isn't yet completely happy with the oil consumption this provides, so unusually heavy SAE 40 engine oil is specified for summer use and SAE 20 for winter. They're now experimenting with SAE 30 for year-round use, but haven't yet approved this. Oil consumption was definitely not a problem on the 404s we drove.

From the extensive Peugeot forge shops come the connecting rods for the 404, with their larger big ends and a shank that's broader in plan yet thinner in profile than that of the 403. Crankshafts are forged too. The design employs separate bolt-on counterweights which make the basic crank forging very simple, allowing a simpe forging press to turn out one blank every 26 seconds. Both 404 and 403 cranks are machined from the same forging blank, the main differences being the larger bearing journals and slightly shifted inner rod journals of the 404.

Originally the new engine's dimensions were set at 85 x 72 mm, more oversquare than the actual 84 x 73 mm, which was finally used to keep the same stroke as the 403 to reduce cost. Five main bearings were also considered when the new XC unit was designed, but discarded on the grounds the added two weren't necessary. This may well be the case, since Peugeot policy is development of strong power through a modest rpm range, rather than extension of the top end.

ASTUTE ENGINE MOUNTING

The engine is angled over to the right at 45 degrees, to lower the car's center of gravity and allow a sweeping hood line for better vision and a more modern line. At a glance this seems to shift weight to the right-hand side of the car, since the crankshaft remains on center, but it's actually counterbalanced by the 12-volt battery, up front, and of course by the driver when he's traveling alone. This placement provides outstanding accessibility to the distributor, dipstick, generator, oil filter and fuel pump, leaving plenty of working room beneath the counterbalanced hood, which swings up well out of the way.

Leaning the engine over introduced some tricky mounting problems, with respect to vibration. The two front mounts can be considered conventional but the rear one, basically a rubber ring around the end of the gearbox extension, carries a pair of forged weights of different sizes bonded on by rubber "springs." These act as dampers of annoying vibrations that originally developed along the 45-degree plane of the engine.

Another refinement under the hood is the use of a magnetic clutch to disconnect the drive to the three-bladed fan when it's not needed. A thermostat in the water pump body switches the fan on when the coolant hits 183° F, switches it off again when it drops to 167°. Peugeot owns the patents on this power-saving device, which it licenses only to Ferrari at present (see Road Research Report: Ferrari Berlinetta, SCI, October, 1960). Minimum use of the fan also enhances silence, of course, since the fan is often one of the noisiest devices under the hood. All this detail attention results in an engine that's incredibly smooth for a four and virtually inaudible at idle.

As we've said above, Peugeot is much more interested in smoothness and silence than in getting maximum bhp from this engine. This doesn't mean they're unaware of recent developments, though; witness the four Welch plugs in the intake side of the cylinder head, opening directly into the integral log manifold and the intake ports. These are not accidental foundry measures to aid the maker of speed equipment; these are the ports where Peugeot had planned to fit the 404 with its own version of Ram Induction! Unfortunately it didn't work out as well as they'd hoped — probably because of their insistence on a full, even power curve — so they reverted to a more normal layout. This, of course, gives an added reason for the inclined engine mounting. Even now the air cleaner piping is calculated to resonate in the most favorable way. (Soon CAR AND DRIVER will show you just what can be done by removing those Welch plugs.)

EXHAUST AND INTAKE

Mastery of gas vibration is displayed on the exhaust side too. Drastic reduction in engine height left no room for the little resonator used in the exhaust piping of the 403, so a bright Peugeot engineer tried putting a resonating can on the front end

of the exhaust manifold, the outlet pipe being at the rear. It does a perfect job of damping out high-frequency exhaust sounds without imposing a shred of back-pressure on the system! A single muffler behind the rear axle mutes the voice of the 404 very effectively.

Peugeot holds patents on its combustion chamber design, which is based on an offset spherical surface. Used in conjunction with a flat-topped piston, they find it to be turbulent and knock-free at the relatively low compression ratios they use. The 404 easily digests regular U.S. gas, and requires very little of it. Perhaps more than most cars, the mileage attained depends very much on the way you drive. Using every ounce of performance and putting up high back-road averages, we returned 20 mpg — the worst we'd ever expect this car to deliver. Most owners can look forward to nearer 30 mpg in average use.

The single Solex 32PBICA carburetor delivers reliable if not first-turn starting, and the engine is soon ready to idle easily without the choke. Its response to the throttle pedal's long travel is only moderately lively, delayed perhaps by the small intake passages and the heavy clutch-flywheel assembly. The clutch itself is a serviceable instrument, without vice or violence.

SILENCE AND SYNCHROMESH

Both clutch and gearbox are housed in aluminum, the utility 10-percent-silicon alloy used by Peugeot in the rear axle as well. One might expect aluminum to be less noise-absorbent than cast iron, in this installation, but Peugeot has found that design has more influence on this than material. Their long experience with aluminum is decisive here, for this gearbox is extremely quiet, the indirect third being just as silent as the direct fourth. First and second are audible, but only that, and besides they're not needed very often. Second is frequently used for starting by factory drivers, but it's just difficult enough that we don't recommend it. The 403's long step from second to third has been closed substantially but still exists in the revised 404 box, which now has a direct-drive fourth gear in place of the overdrive fourth and direct third of the 403. Third is an extremely useful cog on the 404, ranging from 11 to 70 mph with ease.

The new box is synchronized on all four speeds, like the 403, but its low-gear synchro is strangely less effective than that in the earlier car. It works well if you're moving relatively fast, but if you try for low at a crawling speed it doesn't always synchronize. In general the synchromesh (Borg-Warner type) isn't impressive, requiring a certain amount of force at the column lever at all times, keeping you from making a smooth traverse of the gate. Double-clutching isn't required, but it definitely speeds up shifts.

Fast shifts are also retarded by the shift pattern and linkage. The 403 used a basic three-speed H pattern with an additional plane for the overdrive, and the same arrangement is used on the 404, though the internals of the box are considerably different. To use the Peugeot shift properly, it's necessary to let the lever spring itself from first to second gear. Any attempt to overpower the mechanism puts you right into "overdrive" from first. The result is a 1-2 shift that can't be rushed, and a deep jog in our acceleration graph. Most U.S. owners find the shift comes naturally and prefer it to the usual European four-speed pattern.

DRUM BRAKING RETAINED

The 404's torque tube produces a drive line that's very firm and direct in action, like a front-drive or rear-engine car, compared to the more usual leaf-spring rear end. Acceleration and shifting affect the car *at once*, usually with a pleasing solidity, sometimes with an unexpected suddenness. The axle is also unusual in using worm gearing, which was originally adopted to lower the drive line but which remains in production only because they have the tools to make it and know how to do it very well.

Driving the 404 on the open road, checking it for bends in a normal manner without emergencies, the drum brakes are completely satisfactory. They're even and progressive and, with two-leading-shoe mechanisms in the front, require low pedal pressure. Used harder, though, as for a sudden stop from high speeds or in semi-racing fashion, they produce a high-pitched vibration at first and then begin to fade. This vibration has been blamed on the rubber inserts used in the front suspension; it could be also that we had one of the early 404s with four balancing lugs on the cast iron brake drum. These didn't match well with the three wheel studs, and three balancing lugs were later adopted.

Peugeot is conscious of a deficiency in the braking department, and has tried bimetallic brake drums experimentally without success. Tests are now going on with disc brakes, together with Bendix and Ferodo in France, but the results aren't yet conclusive and wouldn't take effect until 1965, anyway.

PRODUCTION PLANS

As has been emphasized by Peugeot, Inc. in this country, the 404 does not replace but supplements the 403, which will continue in production just as the 203 did after the 403 was announced. As one Peugeot executive said, in wonder. "We feel we've made the 404 a better car in every respect than the 403, yet people keep buying the 403 in large numbers!" They'll buy, in fact, half of Peugeot's 1961 production budget of 230,000 cars — 115,000 403s, of which only 60 percent will be sedans. The other half of the output will be 404 sedans. Dealers here will order as many of both types as they think they can sell; no quotas are imposed by the importer. They'll order parts too, since no Peugeot dealer gets cars without having the parts on hand first. The parts value given on the data panel will be increased to $1,000,000 by June first.

The 404 is precariously priced here, both with respect to the 403 and to the domestic competition. It certainly is a better car than the 403; we feel the additional price is more than just. With its long list of extras as standard equipment, its all-round ability as an automobile and its outstandingly good finish and quality for its price, it should be just as competitive in the U.S. The main thing is to try the 404 and let it convince you in its own seductively smooth way. *—C/D*

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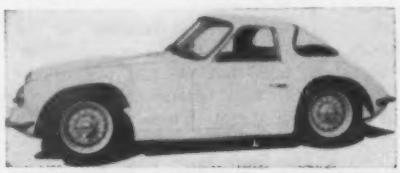

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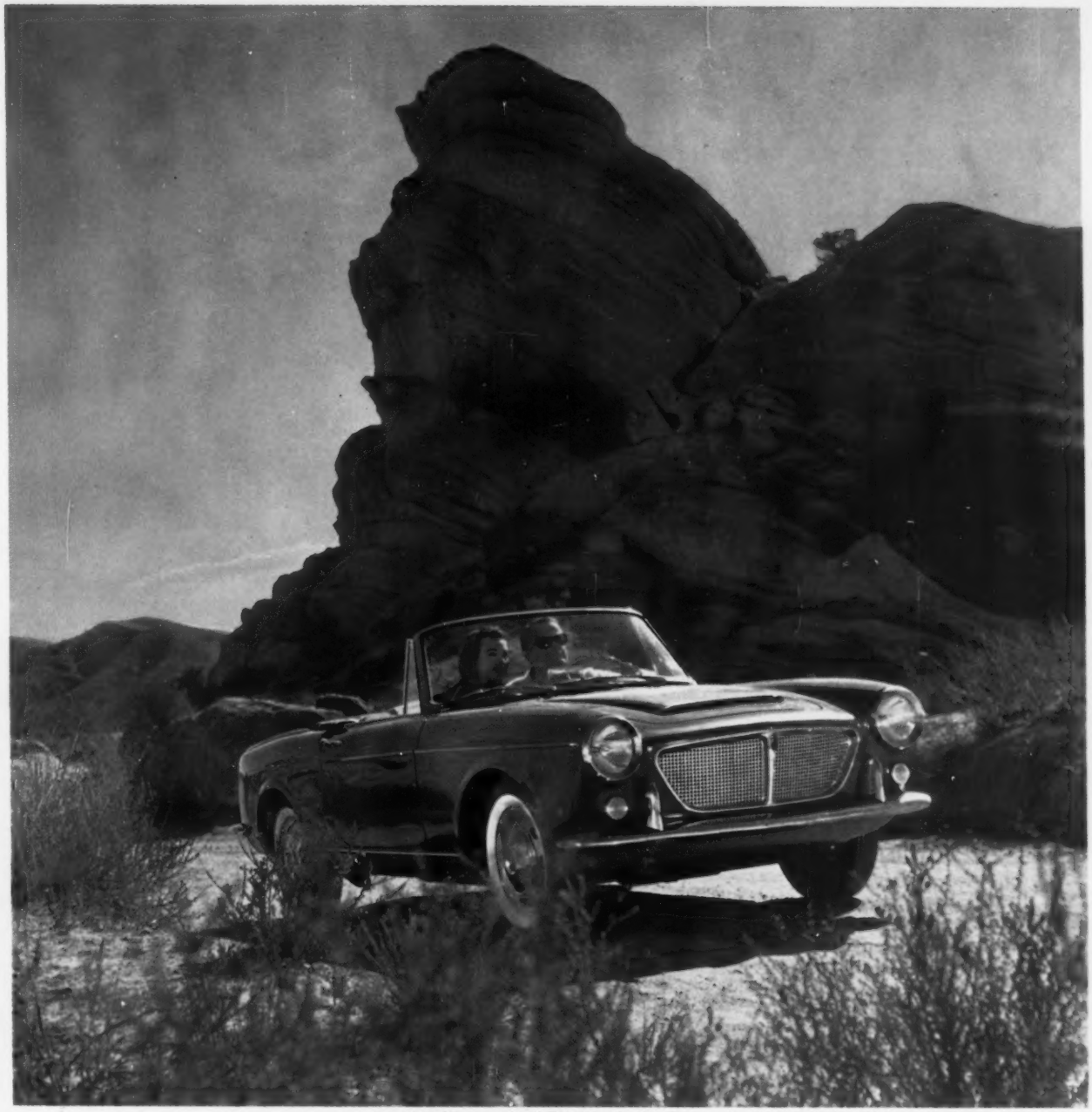

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